

# **The American School and University**

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A YEARBOOK DEVOTED TO THE DESIGN, CONSTRUCTION,  
EQUIPMENT, UTILIZATION, AND MAINTENANCE OF  
EDUCATIONAL BUILDINGS AND GROUNDS

1944

SIXTEENTH ANNUAL EDITION

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AMERICAN SCHOOL PUBLISHING CORPORATION

470 FOURTH AVENUE, NEW YORK 16

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## FOREWORD

THE year 1944 is a year of decisive action. It marks also an extensive appraisal of our culture and its agencies. Consideration is being devoted anew to the place and function of education on the American scene of tomorrow. Those responsible for conducting education in America, therefore, have a new challenge confronting them.

Planning has been defined as the application of horse sense to any given problem. It is what any sensible person does when confronted with a particular problem. It is the application of foresight to a present situation, tempered by the experience of the past. As education looks forward to the post-war period, there is a tremendous need for intelligent planning. To meet the issue of tomorrow, our educational provisions and procedures will need reexamination, revision, and much change. Educational leadership of a high order is demanded. It is time now for that leadership to go into action. Definite plans must be made now for the period following the war. Consideration of such plans should be sought from the American public, and, as far as possible, agreements must be reached regarding the program to be developed.

There is much to be done and many phases of the problem which must be tackled. In this edition of *THE AMERICAN SCHOOL AND UNIVERSITY* yearbook, it has been the purpose of the editors to provide pertinent information pertaining to the school plant and its equipment and supplies which will be particularly timely and helpful to those concerned with the planning of these facilities for the post-war period. Thirty outstanding educators and architects have prepared a series of articles which should be most helpful in any attack on school plant and equipment problems. We present them with our sincere thanks to the authors for their contribution, and with the earnest hope that they will prove of real assistance to those who plan our schools for the future.

By way of introduction to the material which follows, a picture of the situation which confronts the educational scene in America is presented.

### Building Needs

It is quite impossible at this moment to have complete and accurate figures as to the amount of school building needed in the period immediately following the war. Yet, enough data are available to predict the general situation. Replies to a comprehensive inquiry made by the U. S. Office of Education in 1942<sup>1</sup> were sufficiently numerous to justify the general conclusion that the period following the war will witness the

greatest demand for school building construction of all kinds which this nation has ever known. Thirty-six states participated in the U. S. Office of Education study. Returns were received for 5,206 building projects of which 3,199 were for new buildings and 2,007 were for additions to present buildings. Based upon the replies received from this investigation, the U. S. Office of Education<sup>2</sup> estimated that \$5,000,000,000 would be required to construct new school buildings and to repair old ones. Furthermore, this estimate did not include college and university buildings or construction for private elementary and secondary schools. It also did not take into account related community facilities such as recreation.

The National Resources Planning Board in a report to the President in January 1943,<sup>3</sup> on the basis of extensive data, estimated that it would require nine billion dollars during a five-year period following the war to eliminate the deficiencies in building facilities for pre-school and elementary and secondary schools. Dr. Ray L. Hamon, senior specialist in charge of school building problems in the U. S. Office of Education recently estimated that \$500,000,000 a year for 10 years would be required to meet post-war school building needs.<sup>4</sup>

Many of the states are engaged at present in definite studies of need for plant construction. Preliminary reports from several of the states indicate the demand for school building construction is the greatest ever recorded. These needs result from a number of causes. Among the more important are obsolescence of present facilities, almost complete curtailment of construction during the wartime period, changes in population distribution, expanding school programs, and a demand for more adequate housing. Furthermore, we are witnessing the most careful and complete study of school building needs ever made. Undoubtedly one of the results of such studies has been to bring vividly to the attention of the public the inadequacy of present buildings and the need for early action by states and communities.

One can conclude from a conservative appraisal of the data presently available that the country as a whole is confronted with the need for a gigantic school plant construction program. How quickly these needs can be met will depend largely upon the ability of the states and communities to prepare definite plans and specifications, acquaint the public with the facts, provide specific plans for financing such capital outlays,

<sup>1</sup> U. S. Office of Education, "Planning Schools for Tomorrow," (Washington, D. C.: Government Printing Office, 1942).

<sup>2</sup> National Resources Planning Board, "Post-War Planning Program," Report for 1943, Part I, (Washington, D. C.).

<sup>3</sup> Ray L. Hamon, "Post-War School Plant Planning Construction," *School Management*, December 1943, p. 100.

<sup>4</sup> U. S. Office of Education, Federal Security Agency, "School Building Needs," Leaflet #68 (Washington, D. C., 1943).



and, of course, upon the availability of labor and materials.

#### Equipment

An appraisal of the need for school equipment and supplies of all kinds is much more difficult to make, and data are less complete and accurate. Recent school building cost studies indicate that 10 to 12 per cent of the capital outlay for educational building is spent for equipment. Based upon figures available at this time, it seems safe to conclude that from \$600,000,000 to over \$1,000,000,000 of equipment will be needed in the post-war decade for public, elementary, and secondary schools alone. Such an amount of equipment is really big business.

#### Supplies

It is equally difficult to obtain authentic figures on the amount of instructional and operating supplies the schools will need. There is no question but the amount will be much greater than in recent years. The inability of schools to purchase supplies during wartime due to restrictions of purchase and non-availability, the expansion of the school program, the development of many new articles (motion picture film for example) as well as other reasons, all point to a really tremendous increase in the purchase of school supplies in the immediate post-war years. Most recent available figures would indicate that \$150,000,000 a year will be expended for school supplies; and this figure may well be increased by another \$50,000,000.

#### School Buses

One other area which will see large expansion in the post-war period is that of school transportation. Due to a variety of circumstances including shortages of rubber and gasoline, conversion of plants to war purposes, non-availability of materials and labor, and freezing of bus purchases, very few new buses have been bought during the past three years. The average life of a school bus is approximately seven years. Ordinarily, a proportional number of new buses are purchased each year. During the emergency this has been impossible. In addition, there is a definite trend in the direction of larger administrative units and the elimination wherever possible of the inefficient small school, a movement which unquestionably will be speeded up when the war is over. Such action will result in a large increase in the number of pupils transported. All these considerations mean that the demand for new school buses at the conclusion of the war will be the largest the industry has ever experienced. Many believe that 75,000 new buses will be needed during the first year following the war or as

soon as they are available. If the average cost of a new school bus is \$2,000, then \$150,000,000 must be budgeted for school buses in the early future.

It is fair, then, to anticipate that the post-war period will witness the greatest demand in history for school buildings, equipment, supplies, and buses. Table I presents a summary of the estimates.

TABLE I  
ESTIMATED POST-WAR NEEDS FOR SCHOOLS AND  
PROBABLE ANNUAL EXPENDITURES

Plant Needs	Five-Year Period	One-Year Period	Estimated Annual Expenditure
Buildings...	\$ 9,000,000,000	\$1,800,000,000	\$500,000,000
Equipment...	750,000,000	150,000,000	60,000,000
Buses.....	250,000,000	150,000,000	100,000,000
Supplies...	750,000,000	150,000,000	125,000,000
Total....	\$10,750,000,000	\$2,250,000,000	\$785,000,000

Undoubtedly some degree of error exists in these figures. Some may be too large and others too small. They do picture, however, the approximate need which will exist, and the relative size of the undertaking. Even for a country which has experienced a \$150,000,000,000 annual income, the business involved here cannot be described as "small potatoes." In anybody's language, it is really significant. It will take a lot of doing.

There are three fundamental reasons for the size and amount of this business: (1) the temporary curtailment both of building and buying on the part of schools due to war conditions, (2) the expansion of the school program, and, (3) the need to improve school standards and conditions. While it is to be hoped that the decade following the war will result in a catching up and providing facilities to meet needs, there is every reason to believe that the demands for increased facilities in these areas will continue to grow throughout the foreseeable future.

To meet the needs fully and on time, an effective job must be done in presenting the needs to the public, and in helping them to see the necessity for these facilities. If this part of the task is well done, the financing of the program will not offer too much difficulty. The question the public must answer is "what activities does it desire the schools to provide for the public good?"

The people are convinced of the necessity for a good educational program, and, therefore, will be more than willing to make any reasonable effort to provide it.





## PLANNING AND DESIGNING THE SCHOOL PLANT

*There is much to learn about planning and designing the school plant. Much has already been learned. New programs, new conditions, new materials, new discoveries and inventions all bring new problems. Every indication points to a great and growing school building program following the war. It is high time that adequate plans be made. This section of the AMERICAN SCHOOL AND UNIVERSITY brings together a number of important articles by competent people in the school planning and designing field. The ideas and facts set forth should be helpful to school administrators and architects alike as they grapple with post-war building problems.*

# FUNCTIONS OF THE SCHOOL ADMINISTRATOR IN PLANNING THE SCHOOL PLANT

By JOHN A. SEXSON

Superintendent of Schools, Pasadena, Calif.

**E**DUCATION in America can no longer be regarded as a standardized process to be carried on successfully or satisfactorily within a barren, box-like structure without special plan or design. More than three decades ago, the traditional schoolroom began to be supplanted by a structure bearing unmistakable characteristics of having been specifically designed to serve sharply defined and predetermined ends. Some times the design went but a little way beyond better lighting, better heating and ventilation, and better orientation, but increasingly during the school building boom in the decade beginning about 1920, and thereafter, the planning of schoolrooms and the designing of school buildings attracted the thought-

ful attention of school officials and school architects.

## Division of Responsibility

Unfortunately, in the early years of the change in policy, architects dominated in both designing and planning school buildings. The result was a far greater improvement in exterior design and in those features that had to do with health, sanitation, and comfort than in the functional adaptation of the classrooms, shops, and laboratories to instructional needs. Gradually, school officials began to exert more and more influence on the provisions made for the better accommodations of the instructional program and the incorporation within the school plant of a variety of rooms of widely differing characteristics designed to accommodate an increasing variety of educational services. As progress has been made in this direction, the school administrator has gained confidence in his ability to redesign constructively the schoolroom and the school plant in the interest of increased educational service and efficiency.

Architects, at first disposed to resist plans and suggestions from teachers, principals, and superintendents, have turned about face and have recognized that school plants designed to give maximum utility are popular with taxpayers and that they are more readily and more generously financed than were the pretentious, architecturally perfect but educationally inept creations of the earlier period. The result is that it is a now-accepted axiom that the architect may properly be held responsible for the design and the mechanical perfection of the school plant, but that the superintendent, the administrator, is responsible for the plan and for the functional adaptation of the building to the educational and community needs. No administrator can longer excuse himself if there is erected within his school district a school building that is inadequate in utility or that contains rooms poorly adapted to the educational services to be rendered therein.

## Importance of Professional Control

In the Thirty-Third Yearbook of the National Society for the Study of Education, published in 1934, Dr. E. T. Peterson, Associate Professor of Education of the State University of Iowa, Iowa City, defined the function of the school administrator in planning the school plant as follows:

Professional control over the execution of policies in the planning, construction, operation, and maintenance of the school plant is now generally recognized as a part of the school superintendent's responsibility. As chief executive officer of the board of education, the school superintendent is called upon to give the same dynamic leadership in the development and execution of policies in this field as in that



This striking entrance greets pupils of the Washington Junior High School, Long Beach, Calif. This school is one of the earthquake-proof buildings constructed by the PWA

of any other involved in the management of the school enterprise.

In the same publication, Dr. J. W. Studebaker, now U. S. Commissioner of Education, then the Superintendent of Schools in Des Moines, Iowa, and Assistant Superintendent of Schools, Dr. A. W. Merrill, commented as follows:

The school building is likely to be the one reasonably permanent feature of any American school district. Therefore, the serious import to a school system of a building project can scarcely be over-estimated, for mistakes cannot easily be corrected and their effects may be far-reaching.

Nor should the problems involved in planning and constructing a school building be minimized. Any such project involves many business relationships sufficiently new and unusual to present perplexing situations.

These statements written a decade ago are probably more significant today than they were at the time they were written, for education under the impact of the war has become less and less standardized, and the problems of erecting school buildings designed and adapted to serve effectively the present-day program of public education are far from being a replica of even the best designed and best constructed buildings of pre-war days.

#### New Services a Main Consideration

In discussing the functions of the school administrator under these new conditions, it is probably more pertinent to call attention to changed conditions and new problems of building—just exactly how new educational problems should be met and new educational services should be housed—than to attempt to illustrate good practice by pictures of the types of buildings constructed prior to the outbreak of the war to serve pre-war needs. Few public school systems carried on extensive building programs during the 30's because of the depression. Even in the short period of economic recovery which followed the mid-depression collapse, few communities recovered their courage and marshalled their resources sufficiently to plan, design, and construct school buildings. There was, of course, some building financed by funds in part provided by the federal government and designed more especially to serve the necessities of relief by providing labor for unemployed builders, but this did not represent any forthright attack upon the problem of erecting school buildings that were in fact more serviceable and more usable than those planned, designed, and constructed in the decade before.

Undoubtedly the first function of the school administrator in planning the school plant, when construction is resumed, will be to make a serious attempt to see the new school plant, or the old plant remodeled, in the environs and applied to the uses which post-war education will require. A quarter of a century ago, there was a great furor among school builders who suddenly discovered that the school had a community center value, and that it served many purposes besides furnishing space for carrying on activities of children in academic subject-matter. We were thinking in those days, for the most part, of adult education as extremely elementary in character. We were, so to speak, piddling around with an adult education which dealt primarily with standardized classes in home economics, or used the school plant for community gatherings of a social, political, or recrea-

tional nature. The effect of this attitude upon the buildings of those days was largely reflected by the appearance of many types of auditoriums, assembly rooms, music rooms, clinics, and other formal education in rooms designed to serve the needs of those who were interested in recreational activities, in physical education, or in arts and crafts and other similar activities.

The nation-wide picture, of course, cannot be described so simply as this. The writer recognizes the over-simplification characterizing what happened to school buildings between 1920 and 1933 in any single sentence. It has not been his purpose to do that. He has only attempted to call to the attention of the students of school buildings the main considerations of superintendents of schools and schoolhouse planners during those days and to use this as a basis for bringing before present-day planners and designers the somewhat different uses, character, and services to which the schools are likely to be put in the post-war period.

#### The Planning Staff

Before the superintendent can approach this problem, he must recognize, first of all, that education has, during the last three or four years, become so complex that no single individual is any longer competent to



Diffused daylight floods the stairways of the Southwest High School, St. Louis, Mo. through insulux glass block panels. Dust, dirt, and darkness are eliminated





There will be hundreds of thousands of men such as these to be re-trained, re-habilitated, and re-educated after the war

visualize its needs, its ramifications, or the services which the public demands of it. This means, then, that the superintendent must make a careful study of his staff and their activities. He must select wisely all those persons, whether employed within the school system or associated with educational activities in the community, who are in a position to make contributions to the solution of the problem of inventorying types and kinds of services already indicated as a minimum essential school program in the post-war days.

It is not necessary here to discuss the kind of organization the superintendent may set up. It might be a council, a building committee, a post-war planning board, or any other type of organization that might fit into the situation. After establishing such an organization, the superintendent should call these people together and take whatever time is necessary to point out to them the shifts and modifications in educational practice, procedure, and services that have already occurred. He should call to their attention the evidences that other similar shifts and modifications are already clearly indicated. Then, after illustrating the point and having set up the procedure, the superintendent should start these people on the task of assembling the data out of which educational planning for the post-war period may come.

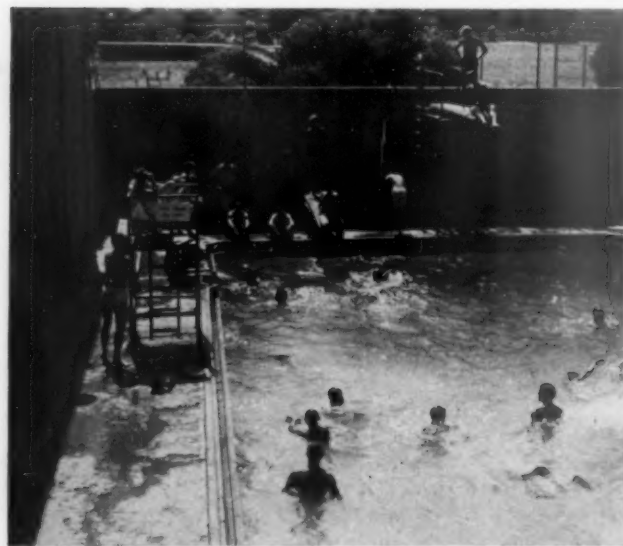
#### Content of the Building Survey

No doubt, the first step will be a building survey of the present school plant. This survey should go beyond a mere counting of classrooms and a casual modification of the standard room plans and details which have constituted the basis of the previous building programs. Without arousing antagonisms or bringing criticism to bear upon those who are responsible for what has been accomplished in the community, the superintendent and his advisers should skilfully bring to the attention of all people involved the shortcomings and inadequacies of the existing plant, even in the light of the changes that have already taken place. From this point, he should develop the educational problems that are already ap-

pearing, pointing out how much modification and change are likely to be necessary if these problems are to be solved.

#### Pitfalls of Not Planning

Besides the materials thus produced, there should be developed a building fund within the financial ability of the community, compatible with its capital outlay policies, that will provide the funds necessary to construct the buildings designed and planned to meet the needs of the educational program. It is quite apparent, even now, that the passage of large bond issues and the usual financial routines by which previous building programs have been financed will not be readily accepted by most communities in the post-war period. It is already clear that the Ameri-



The post-war program will emphasize health and recreation. Now is the time to look ahead and plan adequate facilities

can people are going to emerge from this war, not only heavily in debt, but with a return to the old-fashioned notion that it is highly desirable to keep out of debt and to avoid the paying of large sums of money for the floating of debts. One hears optimistic predictions that federally subsidized public works programs providing employment will be thrown into gear immediately following the war, and that this will finance the school buildings' needs. Regarding this, the writer has no opinion; but if this is the case, it is more important than ever that the planning be done immediately and that it be adequate.

California, for instance, has just finished girding its school buildings with concrete and steel to protect them against the hazards of earthquakes. Because of this, it finds itself possessed with immovable standardized buildings so rigidly constructed that they can neither be moved nor remodeled, standing in all too many cases in areas from which the population has shifted; consequently, of little or no serviceable value to the present educational program. How

generally these conditions exist throughout the country, the writer has no information. He suspects that the situation is more common than one would hope.

There can be no question that population shifts will constitute a major problem in schoolhouse planning. While we shall not have a great increase in population, millions of our families are going to move from their present places of residence to new locations. Part of this will be occasioned by the supplanting of our war economy by a peace economy. Some shifts will be due to the changed transportation picture; some, by new building materials and new designs. In any case, existing school buildings will be poorly located with respect to population centers. Existing school buildings will be badly adapted to needed educational services of vastly different character from those provided in the pre-war program.

Notwithstanding all these building deficiencies, the school administrator will not be given a free hand by many communities to correct them immediately by means of newly planned and newly designed plants. Remodeling of the most glaring defects will be the first step. Here, planning and a bold attack are clearly indicated. Money is surely wasted in half-planned, poorly designed adaptations of old rooms and plants. The difference in cost between a thorough and fairly adequate job and a makeshift is usually insignificant. Moreover, the expenditure of any sum of money on a remodeling job is likely to be accepted by the taxpayer as a final solution and to bar the way to further changes or new construction.

#### New Educational Services

No adequate list of new educational services likely to be indicated by post-war needs can be made in advance or for all kinds of communities. One must be content with a few illustrations and trust to the professional competency of the local administrator to



The school plant of the future should have all the necessary equipment for adequately training students for post-graduate jobs

identify the educational needs of his community and to build to serve them.

*Post-War Educational Need Number One:* If war experience has taught the American people anything, it is that education is a continuous process; that there are no "pre-school" children; and that the school buildings of the future must contain rooms and facilities for the educational service of children heretofore regarded as below "school age." The needs of these children may not be satisfactorily met in any of the rooms to be found in existing school buildings. New facilities needed are suggested by the following:

1. Pre-natal clinics
2. Baby clinics
3. Play space where the younger children may be segregated from the older children, and where equipment for the use of these younger children may be available
4. Special kitchens for feeding
5. Special provisions for rest and isolation
6. Special facilities for educational activities suitable for their stage of development

*Post-War Education Need Number Two:* Rooms designed for the use of parents of children of school age where they may—

1. Gather for the discussion of problems of child growth and development
2. Study exhibits related to nutrition, posture, school achievement, and all other phases of school life
3. View motion pictures dealing with problems of child growth, development, and education
4. Read selected books, periodicals, pamphlets, bulletins, government publications, etc., related to the nurture of children, to family relations, and to social and economic problems of the family.

These are illustrative only. No effort is made to exhaust the categories of needed educational services. On the contrary, the object is entirely to arouse curiosity and to spur administrators to take a large, over-all view of community educational needs, and to plan and design the educational plant to meet adequately these needs.



The nursery school is here to stay. Special housing, equipment, and facilities must be provided if the need is to be met





*Courtesy National Recreation Association*

# FUNCTIONS OF THE ARCHITECT

## IN PLANNING THE

### SCHOOL PLANT

By **WALTER H. KILHAM, JR.**

Morris, O'Connor, and W. H. Kilham, Jr., Architects  
New York, N. Y.

**H**AVING accepted the invitation to write this article, with some misgivings I stopped to consider what it was I had agreed to do. If the title could be paraphrased with the current "so little time," it would come closer to expressing my feelings on the task before me. The functions of an architect, of course, seem limitless, until you attempt to list those that might apply to other architects as well.

#### **Each Project an Individual Problem**

One of the beauties of the architectural profession is that it affords an opportunity for an individual to make a contribution to the society in which he lives. Each must do this in his own way and can scarcely make precepts for his fellow. And again it would not seem advisable to propose rules for the solution of a problem when the primary function of the architect should be to approach each new problem as one to be solved under its own peculiar circumstances.

A few years ago I was talking about plans with the head of the New York Public Library. Concerning one of the monumental edifices in a neighboring borough, he said, "I think you should go over to see this. You will be interested in the way the director has adapted his library to the building." The older generation expected public buildings to be designed according to the accepted canons of architecture; but, it is, perhaps, in the life and needs of a community and the building methods of his time that the modern architect will find his source of inspiration. It has been said that architecture is the best record of a people. It is given to the architect to tell this story.

#### **Before Starting the Plan**

The planning of a school involves the consideration of many factors—educational, social, administrative, etc., as well as location, size, cost and maintenance. In larger communities and municipalities, the local school board will generally prepare a definite program of requirements and perhaps a guide as to recom-

mended building methods based on experience with their schools. The architect's task is to convert these requirements into plans and specifications for the building.

Before starting the plan, however, the architect will certainly wish to study the site, and the board may be anxious for him to become as familiar as possible with their methods and aims. In one case in my own experience—a small college—the committee actually arranged for us to teach a course at the college and take residence there that we might really "live with the job." They felt this investment in educating us in the ways of their college would be reflected with increased value in the plans for future buildings we were engaged to prepare.

#### **The New York Program**

Besides the site, an analysis of the neighborhood and the effect its consideration might have on the particular plan might be of value. In the case of New York City, for example, the board of education, with an extensive building program, will determine a policy which will apply to their schools. One may well ask what need there is for the architect to go further.

If you have lived in New York City a little while, you realize that it is not so much a great city as a collection of little villages. Each neighborhood has its own drugstore, markets and movie theatre around which the life of the community revolves. One does not think so much of New York City as of Hell's Kitchen, The Lower East Side, Greenwich Village, Yorkville, Fordham or Washington Heights. Often grouped around populations of foreign origin, each district will have its own newspaper in Italian, Yiddish, or German, as the case may be, and even in English will have its own local paper such as The Bronx Home News.

#### **Preliminary Studies**

The detailed analysis of the site, the neighborhood,

the present schools, and so forth, as well as suggestions from the architect's experience and study of schools elsewhere, might suggest certain modifications of the general program to better adapt it to the particular school. It has been our recent experience with the Board of Education of the City of New York (on being awarded one of the post-war elementary schools) that such a study would be welcome, and we were encouraged to submit a preliminary report for our school. In this investigation we followed closely the principles set up in the program furnished us and the various factors brought out in a paragraph on the "Underlying Educational Philosophy of the School."

First there was an analysis of the space requirements and its arrangement on the site in accordance with the recommended space relationships, areas, floor levels and orientation.

The second part was a summary of the results of our interviews with the various authorities, local school supervisors and principals, etc., and people in the neighborhood, as well as our investigation of local conditions. Our program had indicated that much greater community use of the school than had been customary in the past was desired.

#### The Architects' Report

There is not space in the short compass of this article to cover the report, but in brief the items were:

#### The Neighborhood

Locally known as "Frog Hollow," the neighborhood was composed of people of chiefly Italian descent and some Irish, hardworking and of small means. And if

some thought they wouldn't appreciate the recreational facilities that might go with the new school, it was equally clear they had never really had any to judge by. It was said that they were not interested in forming civic groups, being a home-loving people, yet there was certainly a community feeling for the old school we were to replace. Children of the third generation of some families go out of their way to be numbered among the pupils. While not too good, the children were not as bad as in some districts, and if they occasionally blew out the window panes with an air rifle, it probably all came out for the best later on at Guadalcanal.

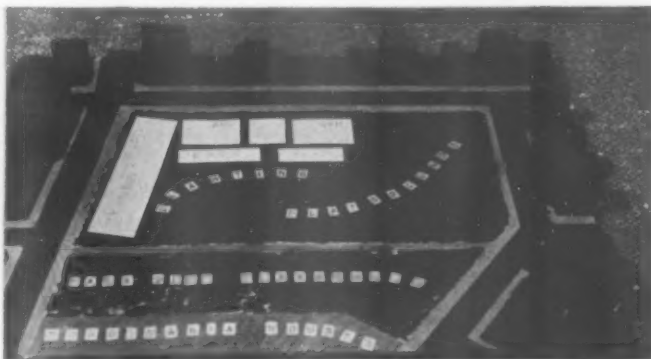
#### Adjacent Housing Development

It was estimated about 75 per cent of the pupils would come from the proposed housing development immediately south of the project. It was understood that it was the policy of the New York Housing Authority to make special efforts to see that the tenants either came from those displaced by the new construction or from groups of a character similar to that in the neighborhood.

#### Recreation, Civic and Social Activities

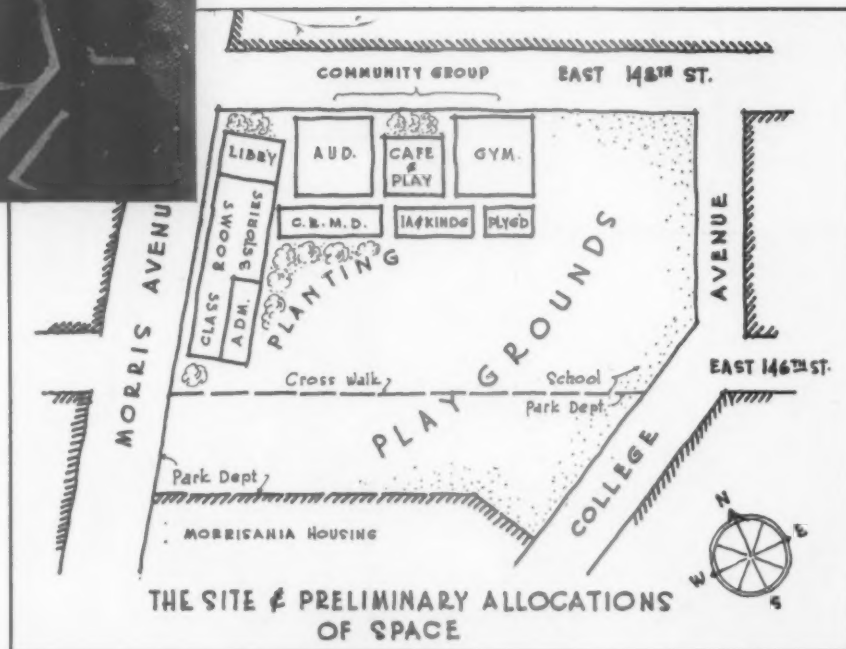
Inquiries indicated that public schools were not the center of civic activities in the neighborhood at this time. A number of reasons were given—some due to the school policy and some to the character of the people, such as:

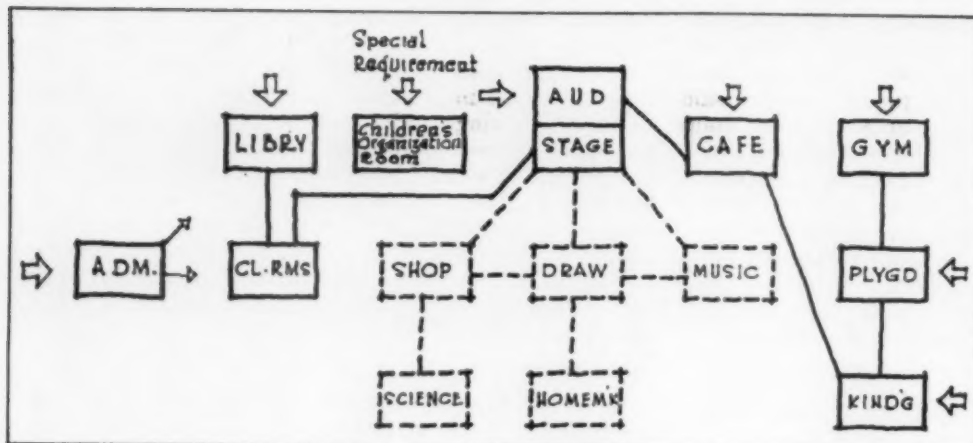
- a. The difficulties of administration and maintenance in keeping the school open after regular hours



Left—The small scale plot plan model helps in the visualization of space allocations

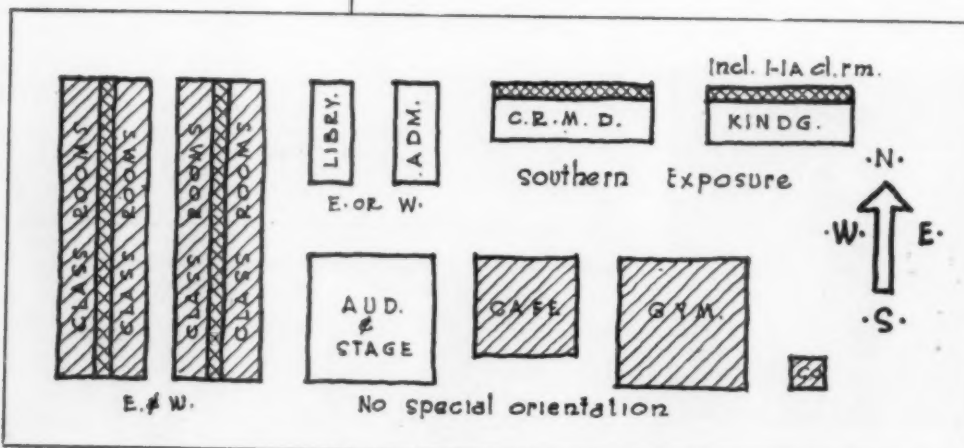
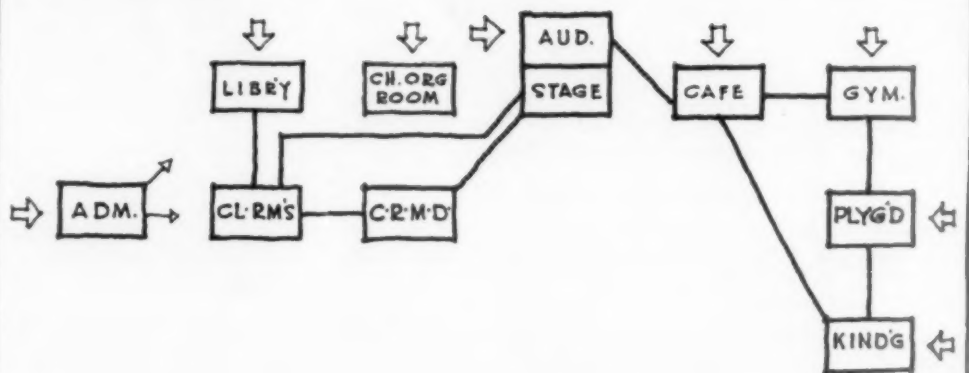
Right—This diagram was prepared as part of a preliminary study requested by the Board of Education for a post-war elementary school





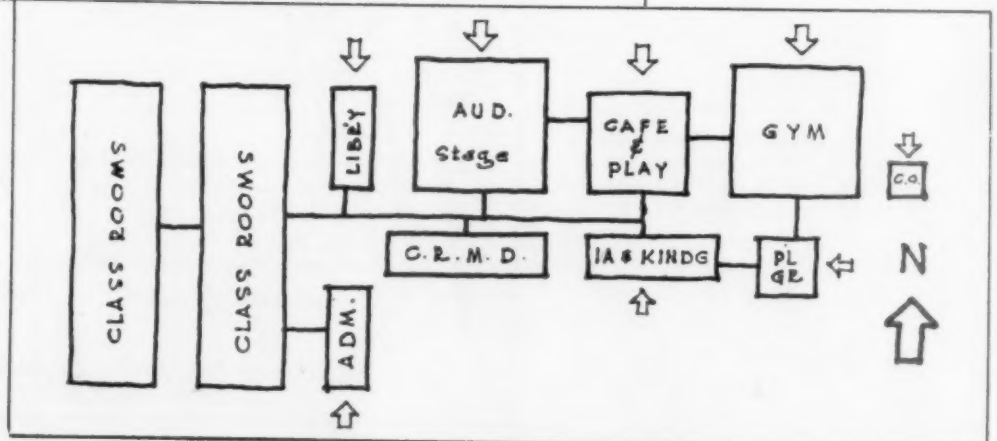
Left — Standard space relationships. The solid line indicates units of this school; dotted lines, standard

Right—This diagram is limited to P.S. 18



Left — Comparative areas, preferred orientation and floor levels. All elements are preferred on ground floor. Hatched ones may be on other levels

Right—A consolidation of the two diagrams immediately above







Right—Growing things. Their public school



Left—Growing things. Neighborhood backyard

- b. The feeling of the children that school-supervised extracurricular activities were just "more school"
- c. The lack of time for cultural pursuits on the part of the parents
- d. The belief that the people were "uninterested"

This all seemed quite discouraging. On the other hand there were found to be many clubs in the neighborhood of an Italo-American or business type. On occasion these sponsored affairs for the boys such as having Joe Di Maggio up to encourage sports. Films about America are of great interest to such groups and films about their occupations, such as certain building trades for example, would appeal to them.

For the gymnasium, too, there was always a demand by basketball teams and others. As things are now at a nearby school, although the boys have asked several times, the use of the gymnasium has been denied as the school didn't see who was going to be responsible for order or who would pick up afterwards.

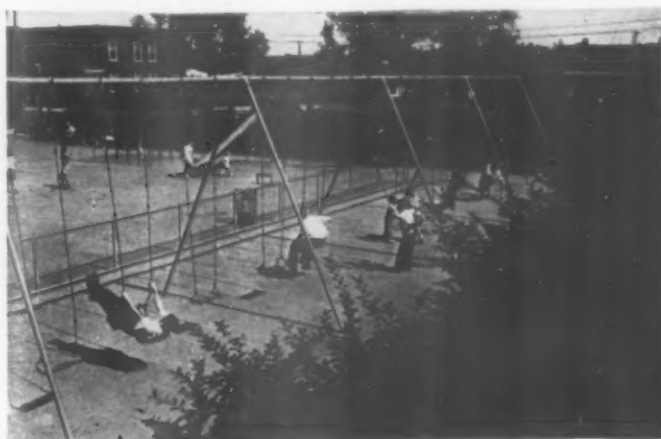
In brief, the problem was not only one of building the necessary space but of finding some way of reor-

ganizing the school itself so that people would be encouraged to use the facilities. Considering the building only, the type of activities had considerable bearing on our plan arrangement for the public part of the building and in so arranging it that it could be closed off from the classroom section.

#### *Contributing Features*

**Corridors.**—Both in classrooms and corridors there was found to be a demand for more "pin-up" space. It was suggested reversible panels of tackboard and plasterboard be installed in desirable areas so either surface could show. It was also hoped more natural light would be introduced into the corridors.

**Lunchroom-Auditorium-Gymnasium.**—Again considering a wider usage, we recommended that the gymnasium-auditorium-lunchroom group be on one level rather than over each other as was the usual New York custom. In this way, they would supplement each other at the time of a festival or public occasion, on rainy days the play space would be augmented by contiguous areas, and all would be on the ground floor



Right—Playstreet in "Frog Hollow"

Left—Playground in Queens





Courtesy Citizen's Housing Council of N. Y.

Young feet will stray into danger

level which everyone considered to be most desirable.

**Kitchen.**—As the kitchen in the schools we examined were not completely utilized and the luncheons when served were very simple, we proposed that it be of a cafeteria-alcove type serving directly into the playroom over a counter and closed off by overhead shutters when not in use. The space saved would be added to the adjacent play space.

#### *Architecture*

Although rundown, we thought the neighborhood had certain redeeming features not only in picturesque but in the trees and backyard gardens—even fire-escape flower pots. The local schools were all rather barren and bleak despite the acknowledged love of growing things on the part of the children who bring plants from home. So first we encouraged more landscaping.

In the commendable effort to reduce maintenance by the use of durable materials, it seemed to us a certain human quality was being lost in the schools and therefore recommended that more consideration be given to aesthetic qualities in their selection. There was, a little, the feeling that the schools were built not so much for the children as in spite of them.

#### *Vandalism and Playgrounds*

The destructive tendencies of the children were everywhere the major topic, especially in regard to playgrounds. A number of suggestions were made to improve conditions which, in general, we followed in our plans.

The cynical thought that no playgrounds were necessary since all the children did was to shoot craps and gamble with cards, while others said that even if we did have playgrounds, they would prefer the street. When we looked at the local school playgrounds, we agreed the street had more appeal.

It is still an academic question whether to surface



Courtesy National Recreation Association

UNLESS paths of safety are provided

the playgrounds with concrete or asphalt. I never tried to slide to home plate on concrete in my youth, but I think I would rather roll dice than try. We think that if part of the playground were surfaced with dirt, it would be as appealing to children as the neighborhood back lots. In any event, we felt that first the playground should be more attractive with trees and planting—big trees that cast a shadow today, not eleven years from now. As one principal said, "If you could make the playground pleasant enough so that mothers would come with their baby carriages, much of the troubles of the authorities in supervising playgrounds would cease."

With the planting, too, we hope to isolate the building from the major play areas and street. It will be pleasant from the inside and perhaps the temptation to lay a barrage on the windows will be lessened. At least the trees will serve as a barrier. According to the Bureau of Standards the best way to reduce noise is to eliminate it at its source. We can't do this, but an intervening space between the building and the din of the playground will help.

Also of great importance was that the school authorities arrange to keep the playground open after hours. This should tend greatly to reduce mischief in a neighborhood where there is no other place to play. Perhaps some arrangement can be made to operate the playground in cooperation with the Department of Parks who are organized to keep their playgrounds open at all times and who will have an area for development adjacent to the school playground as part of the Housing Project.

Our allotted space is more than taken. If we have suggested that, in some cases, the architect be called upon to put his experience and training to more work, we hope that he will gain a greater realization of the problems facing a school board and perhaps come forward with suggestions that will help towards the advancement of school planning.



# **FUNCTIONS OF THE MANUFACTURER IN PLANT PLANNING THE SCHOOL**

**By RAYMOND V. LONG**

**Director, Virginia State Planning Board, Richmond**

**M**ANY of the items entering into the construction and equipping of a modern school plant have little or no relationship to the educational program, but are strictly service materials and equipment; on the other hand, many have a very close bearing on the educational program.

The equipment and materials which serve the educational program directly have evolved from a simple and limited list of items into a complicated list of specialized items. The purchaser is confused by the wide range of materials offered in the manufacturers' catalogs. Added to this, the emphasis of the sales representative on details that in many cases are minor make him even more uncertain as to the equipment best suited to his educational program.

This situation is not the fault of the manufacturer. Education either has not known, or has been too reluctant to say what it wants, except in broad generalities, and the manufacturer has had to depend largely on his own resources and studies in developing educational materials and equipment.

## **Manufacturers Fill Gap**

While many isolated studies have been made by individuals in education and by architects familiar with educational needs, these studies in most cases have not been based on a wide selection of the authoritative judgments of teachers and supervisors in the field and at work with the materials and equipment on the market. Educational organizations have given relatively little attention to these important problems.

The manufacturer realizes full well that the educational field is not acquainted with what it needs and that it does not know what it wants either in the field of educational equipment or in the field of materials entering into the construction and equipment of the school plant insofar as they have a direct bearing on educational offerings. He is also fully aware of the fact that purchasing bodies generally are unfamiliar with educational programs and procedures and that, in the absence of definite criteria or standards as guides, they are not in a position to select with assurance the equipment and materials best adapted to educational programs. Therefore, the forward-looking manufacturers have for some time been training their representatives to acquaint themselves with educational procedures and educational programs, with the result that in the large majority of cases the purchasing bodies and the field of education generally have depended upon the recommendations of the manufacturer or the manufacturer's representative. While it is quite true that purchasing bodies

are often able to make better selection through sales representatives who are familiar with educational practices and needs, it is also true that in many cases this is not a safe or sound practice.

## **Educators Need Professional Advice**

Paradoxical though it may appear, teachers, supervisors, and others who use the materials and equipment from day to day have relatively little to say concerning the design or type of equipment that is purchased. Also it is obvious to anyone visiting school plants and witnessing the use of these materials and equipment, that teachers are generally unfamiliar with the proper use of them.

As an example, many school plants depend upon gravity exhaust for ventilation, and there is much complaint from teachers, children, and parents concerning the unsatisfactory functioning of such systems of heating and ventilation. These complaints, however, are usually due to the fact that teachers, principals, and others responsible for operating the plant are quite unfamiliar with the principle under which such a system of heating and ventilation operates. It is not uncommon in visiting a classroom where such a system of heating and ventilation is provided to find the temperature ranging from 75 to 80 degrees, with the windows and doors all closed tightly and little or no exhaust proceeding through the ventilating ducts. Under such circumstances, of course, such a system could not work satisfactorily. It is also disturbing to note how frequently little attention is paid to the reasonable adjustment of window shades, with all the emphasis that has been placed upon regulating them for ample light.

In large urban communities, where skilled and experienced engineering services are either regularly employed or where such services are commissioned to collaborate with the school authorities in specifying and selecting suitable materials and equipment, these problems are usually solved in a much more satisfactory manner than in the much larger number of smaller communities where experienced engineering and architectural services are not readily available.

## **Simplified Practice Recommendations**

In 1939 a program of research and specification writing was started in the field of school equipment, which should lead the way in gradually building up specification guides by educational authorities. This project was made possible through a grant by the General Education Board to the American Council on Education. The program of research was interrupted in May of 1942 on account of the war effort, but will

presently be reopened and further studies will be conducted in the field of equipment.

The first project in this program of research and specification writing had to do with folding chairs. Invitations were sent out to all manufacturers for submission of samples of the folding chairs that were offered to schools as equipment. There were actually 57 different types and designs of samples submitted. Many of them were not designed primarily for school purposes but were manufactured for the purpose of serving as bridge sets or occasional chairs. Despite the fact that many of these folding chairs were unsuited for school purposes, under the peculiar conditions of purchasing under federally financed programs, these chairs were offered at a lower bid and, in view of the limitations on specifications, it was necessary to accept the low bid. The specifications that were finally developed through this study on folding chairs will, if used as guides in purchasing, automatically eliminate many chairs which fail to comply with reasonable minimum requirements as to posture, safety, comfort, and durability.

In addition, specifications were developed for the chair desk and, in cooperation with the National Bureau of Standards, simplified practice recommendations adopted for school tables.

#### **Separation of Functions**

If educational authorities would assume leadership for developing through study and research minimum

performance standards and specifications on school equipment and materials, with due allowances for flexibility in manufacture, to accommodate the different educational programs, such leadership would appear to be the logical and proper function of education. Once such standards, specifications, and simplified practice recommendations were prepared, covering a wide field of equipment and materials entering into the school plant and directly affecting the educational program, local purchasing bodies and educational authorities could effectively use such guides in the selection and purchase of equipment and materials. Such leadership on the part of educational authorities would relieve the responsible manufacturer of an obligation that he neither wishes to assume and which is not logically his function.

#### **Latitude for Manufacturers**

If such specifications were developed by educational authorities with due regard for flexibility, it would leave for the manufacturer a wide latitude in the selection of raw products and in the design and fabrication of materials and equipment entering into school plants. The manufacturer would then be in a position to perform a function that seems logically to fall in his province: manufacturing the equipment and materials that the educational program needs to serve its purpose, but which he is now unable to do except when he determines educational needs through his own initiative.

# NEW VS. OLD BUILDING STANDARDS

By LAWRENCE B. PERKINS

Perkins, Wheeler and Will, Architects, Chicago, Ill.

CAN we agree that this is a large country with a wide range of climatic conditions, many kinds of people, each with different needs and problems? From this rather non-controversial premise it seems obvious that no detail of physical planning of schools would serve every situation, but can we go further and agree that no two schools meet the same conditions and that therefore a solution will be wrong *at least once* if used twice? It is difficult to imagine a situation when two buildings in the same town are to be built simultaneously under identical market conditions in identical neighborhoods, on identical sites. I suppose it could happen, but suppose the more probable situation, one or more of those factors, and the many others not mentioned vary—doesn't the indicated solution change?

These notes are aimed against the idea of physical standardization. The only formula likely to be right much of the time is one requiring an open-minded appraisal of each building problem in terms of the educational and scientific knowledge of that particular minute.

## The Art and Science of School Design

Consider the classroom—with minor variations this

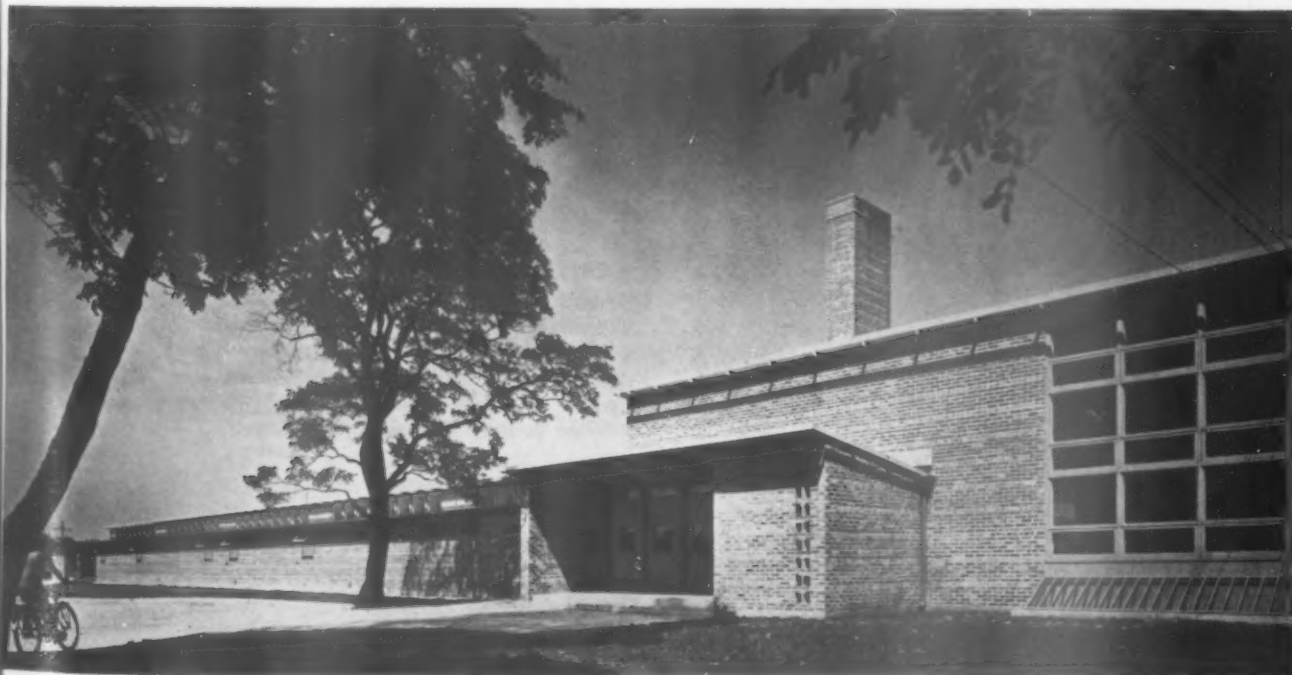
formula has governed the school planning in every state and is law in some:

Width .....	22 to 26 feet
Length .....	28 to 36 feet
Height .....	11 to 13 feet
Light .....	From the left, one side only
Ventilation .....	Six air changes an hour
Orientation .....	East or West
Glass Area .....	20 per cent of floor area minimum

All right! Where did we get this masterpiece of order and simplicity? Assume that 30, or 35, or 40 children constitute a class. They are all more or less of a size. They sit in five rows facing the teacher, each row is separated by aisles. An aisle permits passage along the window and corridor side of the room. The desks are fixed in those positions. The size and shape of the floor are therefore fixed. Each desk should be well lighted. Therefore the ceiling and the window heads should be half as high as the room is wide. (A 12-foot ceiling for 24-foot width, etc.) Artificial light should provide 15-foot candles. Shall I go on?

Why isn't it all right? Would a reputable administrator let his teacher teach that way? Why does nobody build fixed seating anymore?

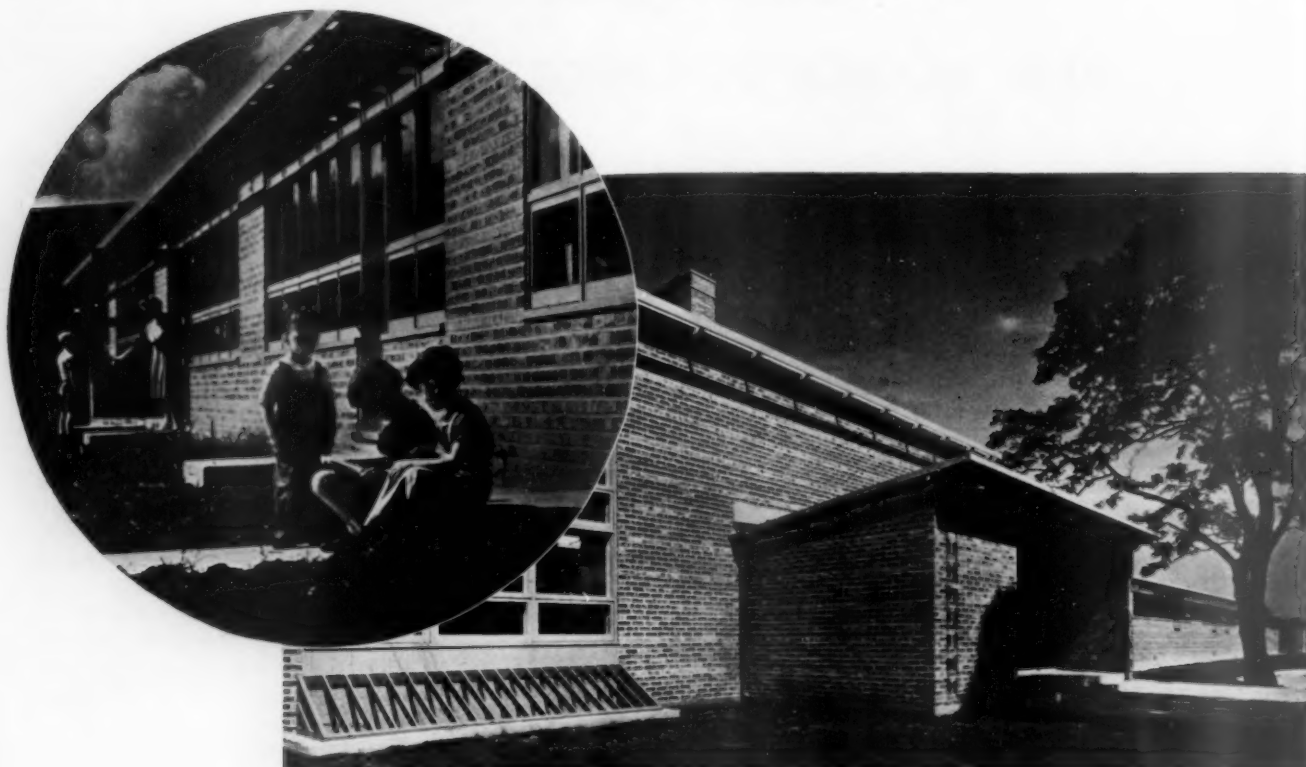
What happens when the sun is beating against the



Photos by Hedrich Blessing

One-story Rugen School, Glenview, Ill., illustrates the value of an "open-minded" approach to school design. Although a wartime project, it is eminently suited to the needs of the community in terms of function, permanence, and cost





one side which admits light, be it East, South, West or even North some of the year? Don't teachers pull the shades and then turn on the lights? Is it good lighting even so?

Were there no left-handed children in 1910 when these standards came to birth? Weren't they worth educating? Aren't there a good many of them?

Who ever saw a building really operated at six air changes an hour after the final inspection of the construction? This is based on an empirical German assumption, never supported by experience. Prof. C. A. E. Winslow of Yale has demonstrated that no air changes in 48 hours can be acceptable under certain conditions. He goes on to show that gravity, infiltration, and open windows are a reliable and inexpensive source of fresh air. If we agree on the answers to most of these questions we must conclude that a beautiful structure of logic has been erected on a foundation which has no existence.

We have to start from somewhere. We have to believe something. If you design a light bulb or an airplane or a factory you ask yourself two questions—*what job must it do* and *what is the best way to do that job?* Is a school building any different? The job is to prepare each child to live happily in *his* world at *his* top productivity. So far as the building is concerned it should give him adequate tools with which to learn and intrude as little as possible in the process. The art comes in answering the first question for each situation. There is plenty of science available to meet each problem with a good solution.

#### Who Is the Child?

The most essential consideration in planning a school plant is the child. Who is he? Where will

he live and work? At what will he work? Is he an Indian living in cattle country, with a future as a producer of beef? Perhaps a barn and a corral are the central element in his school plant. Is he the son of polite suburban parents going to Harvard to study classic languages? How many are there of him, and even in a very polite suburb aren't most of his contemporaries going to work? Is not a work shop a better place for both intellectual and craft work than synthetic cloisters or retread Jeffersonian studies—but I must avoid conclusions because these might be just the thing somewhere.

Just to make things difficult let us assume a student body in a high school consists of 200 boys and girls. After sound and careful guidance work it is determined that 80 are going into the local industries—tool and die works, 30 are going into business and so require commercial subjects; another 40 girls are going to get married and raise babies—home economics indicated; a possible 30 or 40 are going to college (10 for good reasons and the rest for respectability). The balance includes 4 artists, 7 musicians, and an assortment of talents ranging from raising white mice to beauty culture. Each should finish school acquainted with the others' interests, with such general knowledge of our own language and mathematics as we all need, and with a real start in a major field.

That case can be solved without saying that such and such individuals are misfits and should not be in school.

#### The Factory Solution

Imagine a large floor area, well lit, well ventilated, large enough so that each child could have 40 or 50 square feet in which to work. Imagine it subdivided

by screens, movable and reasonably soundproof. Imagine this factory-like floor subdivided in shapes and sizes, dictated by the job to be done in each field of subject matter. Now imagine one more thing, move your faculty around from student to student as helper and critic, so that the teacher's base is no longer the fixed point in your calculation.

Admitting that we took a tough situation, can't you imagine an economical solution in terms of faculty personnel as well as physical plant? This country has learned a lot about factory space in the war, and it may turn out to be a model for large parts of our educational equipment.

#### Details of Planning

Much teaching will always be done in units which approximate a classroom. Factory space is all very well, but language or literature or mathematics sections are limited by the number of children with whom a teacher can establish mental contact. Then it remains to consider the details of such spaces.

#### Separation of Daylighting and Ventilating

Did we agree that light on one side presented a series of limitations on the use of a room. Then light on two sides should be tried. Our office tried this on the Rugen School, in Glenview, Illinois. We think we proved about what you would expect to prove—that more windows in more places let in more light. The by-products are interesting, however; for instance, when the sun is glaring in one side you can close the curtains and still have an abundant source of natural light, with the sky vault or clouds as a source. On a cloudy day all the light you can get is none too much. The left-handed child (I have two

in my family) is taken care of in such a way that he cannot cast a shadow on his work. And by no means least, the place is cheerful—downright buoyant. The long-time effect on people using such a room is measurable.

But isn't all that glass expensive? What about heating? The answers are that the glass area is well worth its cost. It is not an inherently expensive material. A prominent manufacturer has developed a glass and air sandwich which has the insulating effect of storm sash. You use it in large areas with as few sub-divisions as possible. This is a very important material because the heat borne in on the sun's rays is virtually unobstructed, whereas the air-borne heat in the room is deposited on the glass and is borne away very slowly. This trapping of sun heat has resulted in reducing heating costs 30 to 40 per cent in the course of a winter. The saving should be particularly significant where a building is used primarily in the sunlit hours.

But wouldn't double-glazed windows be heavy and awkward to handle? Yes, they would but who said that air had to come in through the same openings as light? If the functions of daylighting and ventilating are separated each can be done better. The ventilator has permanent louvers to deflect water and ply screens, so that two of the problems of a standard window are eliminated. You get just as much air as you ever did and furthermore, you can close the curtains and keep on getting air.

#### Heating

Panel heat is a subject that will force itself on the attention of school men. What it amounts to is heating a room by warming the floor, or the ceiling, or

The children in the inset on the page facing show a sense of "belonging" which comes from the easy access to their classroom, the small lawn which they identify as their own. The speed with which a classroom can be emptied out through the exit leading directly outdoors is a protection in case of fire

Classrooms in the Rugen School receive daylight from two sides, through a broad expanse of glass on one side and through high-level windows on the other. The pictures on the page facing show an exterior view of the window arrangements. In the interior view at the right, note the curtains that can be drawn when the sun is too glaring on that side

Unsurfaced brick adds a warm note of color to the interior, as shown in the recreation room at the right







the walls, or a combination of these by one means or another. This gives promise of being the most satisfactory heat yet devised for school work. The methods of application will vary widely in different climates, but suffice it to say that ceilings or floors can be heated by warm air in ducts or warm water tubes, so that the whole surface becomes gently radiant with the kind of heat you get from an electric heating lamp. In residential work this has been beyond the experimental stage for years; we are now working on its use in schools.

#### *Color*

Maintenance men have found that mud brown, dirt gray, and dusty buff are "practical." That apparently means that these colors are themselves such a good imitation of dirt that further deposits of the genuine article make little difference. Therefore the need to repaint can be postponed. Experience seems to show that drab colors encourage sloppy housekeeping. Some factories have combatted this with white paint in the corners to shame the janitors.

A few sensitive souls have rebelled and a few places have broken out with "pastel" shades in classrooms and corridors. "Baby's breath blue" and "rustling of spring green" apologize for disturbing the nondescript existing order.

Now why not have color? Go back to the first question "What are you trying to do?" Preserve a building or provide a joyous place for children to work and develop. Bright red, yellow, blues, greens, should be employed with courage and discrimination. A dinner entirely consisting of salt and pepper is not tasty. Similarly entire walls or entire rooms in fire wagon red are not colorful, probably depressing.

However I have seen rooms where natural wood walls were unobtrusive in themselves but where the room scintillated from the application of a clean primary color to the doors, sash, and curtains. Also it should be recognized that children are a source of color and should be provided with advantageous backgrounds.

#### *The One-Story Plan*

There are many reasons for building two- or three-story schools. Congested land is one of them. Monumentality and civic pride are others. Economy of construction is the one most often given; but it is invalid. Cold analysis or heated competition would show, in most cases, that more usable facilities can be built with a dollar in a one-story building. This seems difficult to believe, but consider the safety angle. When you are on the ground you can get the children out in a matter of seconds. You can then cut out expensive stair towers, expensive fireproofing, expensive 12-foot corridors which serve no useful purpose except in a panic. When you add to these major considerations a dozen others such as lighter foundations, lighter walls, and the eliminations of wide unsupported floor spans the total saving becomes formidable. When you add the factors of better plans and pleasanter, better lit rooms the one-story plan should be weighed seriously before being discarded. The biggest prop to support the two-story argument, congested land, begins to slip when the school bus is remembered. The cheap land at the edge of town again becomes a possibility and the saving per acre will buy a lot of gasoline after the war. And what is the safety worth itself?

#### *Artificial Lighting*

Artificial lighting is in line for an extensive overhauling. Somebody once got the idea that 15-foot candles on a desk was good lighting. It should be evenly distributed and without glare. Well, the latter is true enough. But 15-foot candles! Many of the war plants recently built provide twice that for the janitors to sweep by. One hundred to 150-foot candles have proven satisfactory in precision work. I have measured classrooms which didn't begin to average 8-foot candles.

A child spends 17,000 hours in school. Most of them start with perfect eyes. More than  $\frac{2}{3}$  finish with defective vision. According to the army, eye-strain is the principal cause, as evidenced by the fact that six months in the army in a sunlit drill field have resulted in conspicuous improvement in the eyesight of thousands of boys. Eyesight is worth quite a bit. How much tax money would you spend on conserving your boy's and your neighbors' girls' eyes.

The means of producing light are being improved. Concealed incandescent sources are in competition with fluorescent, and fluorescent, in turn, with cold cathode lighting which has a most promising future. The objective to keep in mind is the *light reaching the desk*: its direction, quality, and quantity; a secondary objective, the important one of aesthetics.

#### *Floors*

Let us hope that the fabulous post-war period will produce a new kind of floor surface. So far there isn't one that is objection free.

*Wood:* scars, shows burns, and the finish wears unevenly.

*Concrete:* is uncomfortable and dirty.

*Asphalt Tile:* has nice colors but shows where every piece of furniture has stood.

*Linoleum:* a very pleasant floor if renewed often enough, and it costs more than asphalt tile.

*Rubber Tile:* very nice but expensive and easily damaged by inexperienced janitors.

*Carpet:* for schools? Very comfortable, acoustically fine, but unsanitary and would be dirty most of the time.

*Mastic:* rarely offers a hard enough surface in warm weather.

*Blocks on End:* uncomfortable like concrete.

In short there isn't one that is ideal. Each breaks down somewhere. Wanted—a pleasant, inexpensive floor that can "take it."

#### Acoustics

Teachers' nerves are subject to unlimited wear and tear. They do better work when calm. Theirs is an

inherently noisy business. Noise frays nerves. Devices which minimize noise reverberations are not only desirable; they are profitable. A sloping ceiling which dissipates the echo between floor and ceiling is such a device. Exposed beams rather than smooth surfaces are helpful. Very good materials which are heat insulators as well as sound absorbers are available for walls and ceiling finish. The proper combination of these means can be directed to the end of better discipline with less effort. There is no incentive to holler into a rain barrel that won't talk back. Children are apt to be noticeably more quiet in their behavior in a room that has been soundproofed.

#### Community Use

Any capitalist who tied up money in assets which could be used 30 hours a week should have his head examined! But the capital equipment of schools is used about 30 hours a week. This limited use has



Open corridors were unsuitable because of the climate; hence the covered passage pictured on the page facing. The natural wood walls provide an excellent background for pupils' exhibits

The illustration above shows a typical classroom. The furniture can be moved about to suit the convenience of the pupils and teacher. The sloping ceiling dissipates echo; aids heating, ventilating, lighting

Taking down meter readings in the picture at right is Author Perkins. Readings show a satisfactory, even distribution of daylight in the Rugen School.





"... beauty derives from a simple need clearly met."

only an indirect bearing on planning, however. It is primarily an administrative problem.

In Evanston where I live the buildings range in age from 10 to 50 years. Yet the schedule of dances, church services, meetings, games and countless other activities all for adults has to be scheduled weeks and sometimes months in advance. The physical facilities are fairly well adapted to this program, but even this would be enhanced if dual use of plant had been anticipated.

I don't know any rule for adult community provisions which will hold good except to study the things that "go" and pull them into the school plant to divide overhead and capital changes. The top consideration, of course, goes to the child who uses the school during the day, but adults are people too! If they have a place where they like doing things together the end product is a neighborhood composed of friends.

#### And Now About Architecture

Again question one "What are you trying to do?" Express civic ego? Presumably not! Demonstrate the size of the architect's library and the breath of his culture? You can find another architect who disagrees, so you are on shaky ground there. If you aren't doing either of these things, why pay for scene painting?

Gothic pinnacles had an engineering reason for being in the glorious cathedrals of the 12th century. Today they merely add to the burden of maintenance. We don't balance stones when we build; we pour concrete and frame steel. You may be sure they would have used steel and concrete if they could.

Our Colonial period produced many pleasant buildings which met the problems of colonial living and working very well, as well as their means would permit. We don't study under whale oil lamps any more or heat with fireplaces. Why do we still hack up our windows in tiny inconvenient divisions. Why is it honest to perpetuate their limitations?

Why streamline? The superb George Washington bridge has nothing Gothic, or Colonial, or Streamlined. Its beauty derives from a simple need clearly met. A Douglas airliner is supremely beautiful without cosmetics, which doesn't mean that Mr. Douglas builds good schools. Can't we accept this and put streamlining in a category with pseudo gothic and imitation colonial? Why not *just plain buildings*?

Go back to the two questions. Answer them carefully, then build. Keep the rain out. Let the light in. Wrap it up to keep the heat when you want it. Keep the walls out of the way as much as possible. Then think up some nice modern or colonial or gothic features to give it "class." Put these last items firmly in the wastebasket—then quit! I shall do likewise.



# SCHOOL BUILDING CODES

By JOHN E. NICHOLS

Supervisor, School Buildings and Plans, State Department of Education, Hartford, Connecticut

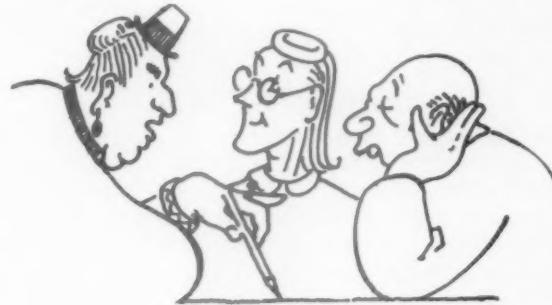
IT is a foregone conclusion that the end of the war will release an unparalleled flood of school construction. For a number of years the normal replacement of obsolete buildings has been piling up behind a dam of war restrictions. These same restrictions have prevented relieving any but the most severe cases of overcrowding that have come as a result of recent shifts of population. Added to this enormous and still growing backlog of potential projects are many others which would normally go undone but which will be undertaken in the general stampede for a greater share of the money which the federal government will almost certainly offer as a subsidy to encourage peacetime industry.

There has been general apathy to actual planning of post-war construction, despite the urgings and warnings of interested groups. Quite suddenly within the past few months this attitude has given way to pronounced concern and bustle. All about us post-war planning committees are springing up. So numerous are they becoming that they threaten to tangle each other up like the civil protection committees were doing but a year or so ago. In many instances municipalities have gone so far as to arm themselves with actual working drawings and specifications for fire houses and town halls—and school buildings.

## Limitations to Scope of Studies

Most of us look back with a great deal of regretful head wagging upon the results of the great pump-priming programs undertaken by the PWA and WPA seven or eight years ago. Regardless of whose fault

may have been the tragic waste of many hundreds of poorly planned, misfit school buildings, the fact remains that the school administrator was caught flat-footed in many instances. To begin with, there were many localities without any definite, thoughtfully worked out, long-range schoolhousing program. In many instances we were unprepared to say, when suddenly the time came, just exactly what was needed in the individual building. Finally, there were many cases where, although the over-all building program and the necessary facilities in each building had been



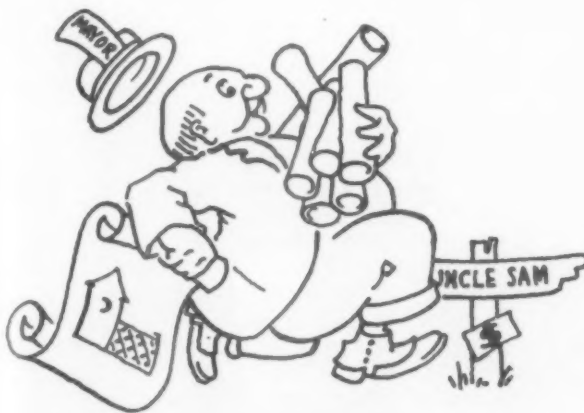
"Committees are springing up ---"

well worked out, we were unable to indicate clearly and precisely the characteristics which would make those facilities most satisfactory.

There is promise that we shall be better prepared for the building program now appearing on the horizon. Our many post-war committees are seeing to that. School men, with lots of assistance, are studying their communities' educational needs. We shall be able to say with comfortable assurance that in such-and-such a location we shall need a certain type of school to accommodate this or that number of pupils who should have thus and so kinds and numbers of rooms. But how many will be prepared to speak in anything but the most generalized terms of the relationships, locations, sizes, shapes, color, materials, permanency and mobility of rooms and their equipment, of doors and windows, corridors and stairs, floors and walls? How many will be able to describe these elements of the building—not in architectural or engineering terms perhaps—but in the precise terms of their utilization?

## Sources of Help

It must be borne in mind that most school buildings are built by committees who have had no previous



"--- stampede for a greater share of the money."



experience in their design and construction. Such groups must look outside their own membership for guidance if their handiwork is to hold promise of success. In many states they have no place to turn except to their superintendent of schools or to their architect—neither of whom is likely to be experienced in the intricacies of school planning. Most school administrators will freely agree that years of using school buildings will not alone make them competent school planners. The mere fact that an architect is a clever designer and an expert in materials—even though he may have in the past obtained a few school-house commissions—is no assurance that he has a thorough grasp of the problems and aims of school design.

In some states there are school building specialists whose services are available to hard-pressed building committees. These services generally consist of occasional advice during the preparation of plans, with a final review of them when completed. Valuable as this service is, it needs to be supplemented by reference material, readily available at all times, to give guidance in the endless questions which must be answered as the work progresses; to give some advance indication of what approving authorities, if any exist, will require.

#### The Regulatory Code

The instrument usually employed to give instruction concerning the requirements for approval is the school building code. In more cases than not it is neither used nor designed to present much more than those state regulations that standardize certain aspects of design and construction. This type of code can be designated, to distinguish it from other kinds, the Regulatory Code.

It must be admitted at the very outset that regulations are a practical necessity. They are essential to furnish some degree of protection against ignorance, stupidity, and unscrupulousness. In most situations they are not needed. The vast majority of architects and building committeemen want to do a job which will reflect credit upon themselves. But regulations must be established for the few who are too lazy or too stupid to inform themselves on the problems they face, or who are willing to sell out for personal gain. In a very real sense they may be a sustaining wall at the back of the official who is charged with the responsibility for protecting the interests of the public and the children. On the other hand, specific regulations may well offer the public protection from the overzealousness of that same official when sometimes he loses perspective in the pursuit of his specialty.

#### Weaknesses and Shortcomings

Despite the necessity of the regulatory code, its weaknesses and shortcomings as a type are manifold indeed. To begin with, the whole philosophy or viewpoint of the regulatory code is backward looking, not forward looking. It is occupied with past mistakes in school design and with their elimination from the work at hand. This is as it must be perhaps. We may indeed learn from our mistakes. But it is not healthy, certainly in a school code, to dwell upon them. When we do, we become so fascinated by the errors we have seen committed and which we cannot avoid in the

future, that our approach to the task of planning becomes mechanical, cautious. Instead of fixing our gaze upon the horizon ahead and striking out boldly toward it, we advance by peering fearfully backward upon our tracks to see that we have not trod upon some fetish.

As an example of this, consider the time honored rules concerned with the location of classroom windows. To quote from one code a section which is repeated in many another:

Windows will be placed on the long axis of the room. Light shall come over the left shoulders of the children as they are seated. . . .

This is all very well, theoretically at least, for the lead-bottomed read-and-write variety of program. It is barely possible that some fearful evil does lurk in those terrifying cross lights. It is possible that only that light which comes from the left is beneficial. Perhaps it does not matter that the pupil in the last row next to the windows gets most of his light from in front, or that the little girl in the front row gets hers from behind, or that the child over near the corridor gets practically no light at all—just so long as the windows are on the left side of the room. Perhaps—but it is a safer bet that an abundance of cross lighting is far more to be desired than are low levels of lighting that arrive unsullied from the left. Especially if our pupils are not bound immovably to their fixed seats. Here and there, at least, a few intrepid adventurers have dared to cut loose from the unilateral lighting myth to design schoolhouses whose rooms are bright and cheerful because they are lighted by windows on several sides.

Again, our regulatory codes tend to actually freeze in these unsatisfactory practices which they attempt to limit. Few indeed are the school administrators or teachers who have a kind word to say for a basement or half-basement room. They have been tolerated because somehow they were looked upon as extra space that could be had at little or no additional cost. So many abuses of basement spaces developed, however, that most school codes now place limitations upon them. But when an architect reads in the very code that must be his law and prophet that basement rooms used as classrooms must not be more than three feet below the ground level, unless he is immunized by strong personal convictions on the subject, the harm is done. He is presented with a picture of a school with basement rooms. The first thing we know we are presented with the plans for a building with half its floor area squashed into the ground—the very thing we had hoped to avoid.

It is a well known phenomenon among those who administer regulatory codes that an established minimum invariably and automatically becomes the optimum—the *standard* in the minds of those who use it. In recognition of the evils of crowding pupils in their schoolrooms, practically all states which have codes of any kind establish a minimum number of square feet (or cubic feet) per child—18 or 16 being the usual figure. The ludicrous aspect of these regulations is that they are established empirically on the basis of health requirements. So we go on and on building classrooms 23' x 28' as though those proportions had some inherent charm. Yet we know all the time that

almost the universal plea among teachers who are not vegetables is for more room—room in which children can do something beside sit. The irony of the thing is that our codes are very largely to blame for this unhappy situation. That figure, *18 square feet per pupil*, stands out like a beacon. It is not a point of degradation below which the designer must not sink. It is that level which he is asked to attain—and reaching it, he prides himself on a job well done. What can be said for minimum sizes of rooms can be said with equal force for minimum glass areas and levels of

fire and accident, the prevention of conditions which might spread disease or injure the health in other ways. Those considerations which are of vital importance from an educational standpoint—the location, interrelationships, and characteristics of a multitude of educational facilities—these get short shrift. Every care is taken to put the child into a building where no harm can come to him. But the reason for that building's very existence is blithely ignored.

The designer who is faced with the necessity of conforming to a mass of minutia in the form of de-



"Unable To see the  
forest for the Trees."

illumination, for minimum play areas and exit facilities, for maximum stair risers and maximum reverberation periods. Nor can slavish conformity to established minima be laid at the doorstep of necessary economy. That claim is refuted by too many cases that have gone well beyond our piddling minima in items that really mattered, yet whose costs have not risen to particularly alarming heights. Usually we can attain many more of those things that are useful and needed if those that contribute principally to vanity are foregone.

Another dilemma of those who compile and administer codes is the practical impossibility of devising rules which can be applied with equal validity to a wide variety of situations. If regulations are to do what they are set out to do—regulate impartially and unequivocally—they must be subject to a minimum of interpretation. They must be wholly specific, free from those favorite crawling terms, "adequate" and "sufficient," that mean so little. However, just as surely as a code becomes specific, it must embark upon a sea of definitions and exceptions which is endless—which becomes a morass of split hairs. The end product is so cumbersome as to be practically useless for those who need help. What it can lead to is perhaps most strikingly illustrated by the code of The National Board of Fire Underwriters. It takes an expert to understand it—weeks of diligent study to become familiar with it.

Finally, the great majority of the regulatory school building codes are not school building codes at all, but general building codes applied to schools. In other words they consist of regulations designed primarily to protect the public's physical welfare. Safety from

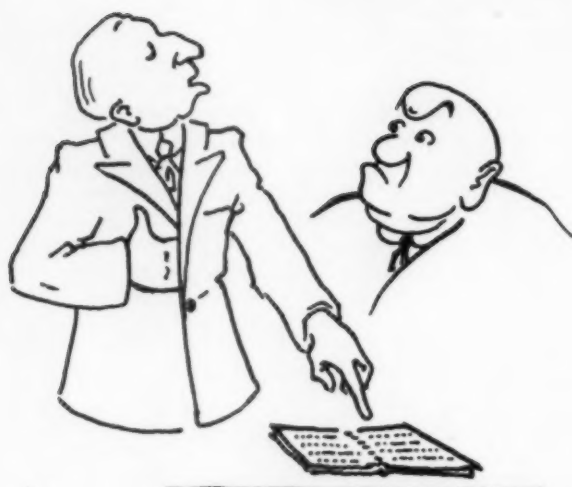
tailed regulations runs the very real risk of having his attention focused upon them at the expense of larger and far more significant considerations. So much of his energies are directed toward seeing to it that this beam is fire-proofed to an approval degree, and that drinking fountain is of approved design, and water closets are provided in prescribed ratio, that soon he is unable to see the forest for the trees. The fire of creative imagination at its best is a sensitive one. Often enough it is a feeble spark indeed in those entrusted with fashioning the tools of education. It can be quickly quenched by a flood of mechanical details. That thrilling vision indistinctly glimpsed at the outset—that vision of a building which, transcending its mundane prototypes to become a sensitive and beautiful instrument of education—that vision fades and is lost forever.

#### The Informative Code

That is the case against the regulatory code. What then is the alternative?

First, it is necessary that we realize that a code can perform a function more valuable and significant than regulation. Briefly, that function is leadership. Leadership through education and stimulation. It should be designed primarily for the great majority of its users who need and desire information and guidance rather than for the minority that must be compelled.

If the designers of our schools and the committee members who are responsible for the building of them are to be lead to solutions and practices which are more acceptable to the educator, we must treat them like reasoning human beings. It is natural that they



"... insist that they be followed blindly."

should resent compulsion; that they should want to know the whys of a rule. It is both futile and dangerous to lay down regulations and insist that they be followed blindly. That sort of thing does not go in a democracy. We may think oftentimes that explanations are not necessary—that they are implied in the rule itself. But time and again that which appears entirely self-evident to the specialist is astonishingly abstruse to the layman.

And it is to the layman, in the final analysis, that the code must be addressed. It is not to the educator. It is not even to the architect so much as to the banker and the farmer who make up the building committee that hires him. These are the ones that must be reached. They must be given the reasons for every recommendation and every rule just as clearly—and concisely—as possible. To do this will often mean going back behind the immediate subject, back to fundamentals. If, for example, we call for classroom equipment, we must explain not only just what is needed, but *why* it is needed and how it will be used—in terms that are free of vague generalities. If we ask for certain protective measures against fire, we must tell something about the ways fires start, spread through a building and destroy; something of the principles of their control.

Besides the very practical advantage of fostering an understanding and willing cooperation, the Informative Code—to distinguish it from its distant cousin, the Regulatory Code—has another advantage which is equally as important. It puts into practice the old adage that two heads are better than one. No matter how convinced we may become that we have discovered the best, the final answer, we shall do well to remind ourselves that in school design, as in everything else, there is nothing so good that it cannot be improved upon. We who are specialists must not forget that specialization has the peculiar tendency of inducing insidiously a form of blindness that narrows the angle of vision without the victim even realizing what is taking place. When that happens, associates

discover us peering at our problems with myopic zeal, unable at last to stand back and see them in perspective against their true backgrounds.

This is not to condone the code which is so open-minded that it holds no convictions. On the contrary, a code can be most informative and most beneficial if it holds strong and definite convictions—and defends them with courage and vigor. But these convictions must be supported by reason. Not by compulsion except as a last resort. Such an approach goes far toward eliminating such wishy-washy terms as "adequate." Adequate can mean so many things that in effect it means nothing. It is very convenient for hedging on a controversial issue. When the subject is controversial, there is all the more reason that the code openly sift the evidence pro and con, come to a conclusion, take a definite stand, and advise accordingly.

That code which is to be most valuable must be as much concerned with principles and objectives as with the means for arriving at a desired end. Emphasis placed upon these can do more than anything else to provide the basis and the incentive for exercising the reason and imagination which alone spells progress. The design of a gymnasium, for example, will grow out of the principles which are to be observed in using it. Familiar here is the issue of organized athletics for a few as opposed to a variety of educational and recreational activities for everyone. The end objective, thoroughly understood, is the designer's surest guide. This is an aspect of codes which has been neglected and shunned. If we are convinced that flexibility is desirable, then we should cite it as a major objective and so actively encourage—not just permit—something better than the usual half measures. The same should be done for reducing construction costs without reducing utility, for making buildings more convenient for a variety of adult uses, for encouraging the development of active learning, for exploiting television and the motion picture, for devising school buildings that are more friendly and



"... can these two be united ---?"



attractive, for reducing permanency below the point where it constitutes a liability.

#### Emphasis Is the Solution

But, admitting the desirability of the informative code on one hand, and the necessity for a regulatory code on the other, can these two which are basically so opposed be united in such a way that the benefits

native material. Where segregated—even though they be placed at the end of the appendix in small type—their susceptibility to ready reference makes them much too tempting to the person who is more interested in getting by than in doing a good job.

Certainly this does not result in a code which is a handy reference manual for the architect or committeeman whose chief concern is with what *must* be



of each will be saved and their weaknesses reduced? I think that in a very large measure they can be.

The answer lies in the skilful use of emphasis. In every respect the regulatory element of our hybrid code must be subdued—made subordinate to the informative elements. To begin with, the regulations should be departmental rules with legal force which can be suspended by the department enforcing them when suspension holds promise of benefiting the school. Under no condition should they be written into state law in a form that can be modified only by legislative action. Second, our regulations should be kept to that minimum which includes only the essentials. Otherwise the teeth become too prominent. Third, our regulations should be placed where they must be searched out; distributed in among the more important infor-

done rather than with what *might* be done. Such an attitude does not warrant encouragement nor does the person who harbors it deserve consideration. Now and again an architect presents me with a set of plans for review with the remark, "You won't find anything to object to in these. I've followed all your regulations to the letter." Usually that man is in for a rude awakening. Not because his statement is an implied challenge, but because it could be uttered only by a person woefully ignorant of the nature of the problems with which he is faced. It springs from a false assumption that a good school building can be designed "from the book." No code on earth can take the place of intelligence and imagination and an unquenchable desire to adventure forth beyond the ordinary.

# PLANNING FOR POST-WAR COLLEGE AND UNIVERSITY CONSTRUCTION

By HOWARD DWIGHT SMITH

University Architect, Ohio State University, Columbus

THERE is very little likelihood that any American college campus will be bombed during World War II or that a single university building will have to be rebuilt in the post-war period as a direct result of enemy military operations. In a way this may have some disadvantages, for in this country we seem to hold to the general theory that an educational building must not be "written-off" as a capital investment so long as it is possible to assemble classes in it, and that the only effective book-value depreciation results from an actual catastrophe or by condemnation. Because the demand for classrooms and laboratories is always far in excess of the supply of available space, the condemnation method of getting rid of obsolete buildings on college and university campuses is generally ineffective.

In spite of freedom from war demolition, the need for new construction at institutions of higher learning will be quite acute after the present war. Except for a small amount of construction which has had some tangible part in the prosecution of World War II, colleges and universities have done little or no building during the past two years. Where war training or war research programs have been placed on the campuses of the country they have generally taken advantage of, or fitted into, existing physical plants. Where such facilities have proven inadequate or have been outgrown, programs have been curtailed or moved elsewhere, and only in instances of urgent need to carry out or to supplement existing programs have educational institutions actually benefited to any marked degree from military-sponsored construction. Such facilities as research laboratories and experimental shops, essential fuel pilot-plants and testing ranges, officers' training quarters (R.O.T.C.), and airports for flyer-training have been added to a number of schools in such ways as to become effective parts of regular teaching facilities after the war. On the other hand, dormitories, classrooms, basic laboratory facilities, and space for cultural studies have not been added—on the principle that military education by contract should be placed on campuses where existing buildings and equipment, as well as teaching personnel, can be made available quickly and with minimum expense.

## Campus Buildings and the "V" Day Program

If we assume for the moment, therefore, that there is great need for a sizable building program for colleges and universities after the war, that program may be looked upon as an important part of a large public and private works program which will provide (1) employment for returning military personnel, and (2) demands for materials made by industry which is reconverted from war production. It is generally ac-

cepted that a program of public works can be made ready to go on "V" Day. Of all the public works which may be considered, only a public roads program may be expected to provide more man-hours demand per planning dollar than a program of building construction. Because the preparation of drawings and specifications for modern buildings, as well as the supervision of their erection, is somewhat more complicated than for highways, the construction of buildings is looked upon as a second item (rather than a first item) in a program to take up available post-war manpower. Aside from any educational or social need which may be involved, college and university buildings would certainly fall into this second item of such a program. Except in matters of financing and controls, and with due allowance for varying local conditions, the fundamental aspects of most college and university post-war programs are quite similar, whether the institution be large or small, state-supported or privately operated.

Because of this similarity of program it should be possible for groups of schools having similar interests, either educational or administrative, to consolidate their efforts and present an integrated and balanced program. With a little "give and take" within the groups, this procedure could show united educational fronts in the over-all picture of the country's post-war building program. Perhaps this idea is a bit too millennial, but its application to the problems in hand seems logical and certainly not impossible.

## Post-War Buildings and the Educational Program

Without attempting to discuss problems of educational policy as a phase of post-war planning, let us consider the relation of a post-war construction program to educational requirements. There are two assumptions which need to be made in this connection. The first of these is that enlarged enrollments may be expected after the war, and the second is, that, generally speaking, the program of higher education will continue on the same principles as before the war.

## Enlarged Enrollments

The assumption of enlarged enrollments seems a reasonable one to make. There are at least three things which argue for it. There will be a return to the normal civilian demand for college education; there will be a greater appeal of higher education in all of its phases from vocational training to metaphysical studies, as a result of the accomplishments of college-trained participants in the war effort; and there will, in all probability, be an extensive subsidized program for returning military personnel. Each of these three arguments is a potent one.

The curve of total enrollments in American col-

leges and universities has been on a steadily accelerating rise for the past generation, and the rise of this curve is so great that it should more than absorb the lag which would have been expected when the effect of the falling birth rate of the late nineteen-twenties reaches the college level. If recent increases in public school enrollments at the first grade level in Columbus, Ohio, for instance, are any indication, the drop in educational enrollments all along the line, due to falling birth rate, may be considered at an end.

The conspicuous contributions to the war effort by college-trained men and women, and advancement preferences enjoyed by them will surely have the same effect upon college enrollments after World War II as after World War I. The part played by the colleges in making these contributions and preferences possible is much more emphasized in these war years than was the case twenty-six years ago, by the presence of the Army Specialized Training Program, V-5 and V-12 programs of the Navy, Military Government

Schools, and similar units on campuses all over the country.

The effectiveness of the educational institutions to organize, administer and implement training programs for branches of the armed forces suggests the desirability of having these agencies carry on (1) programs of educational rehabilitation conducted in behalf of the federal government in the discharge of its obligations to returning personnel or (2) out and out educational programs offered to mentally capable military personnel in lieu of discharge payments, pensions, or bonuses.

The relation of the enlarged enrollments to the construction program is basically one of size. More classrooms and libraries, more laboratories and studios, more recreation facilities, and more dormitories will be needed. These are the facilities which have been neglected on account of the war effort. The relation of possible subsidized programs to post-war buildings is not yet clear, nor will it be until the

#### Four Comprehensive Campus Plans

The accompanying diagrams outline the campuses of four Mid-Western state-supported institutions, Ohio State University at Columbus, Ohio, University of Illinois at Urbana-Champaign; University of Michigan at Ann Arbor and University of Wisconsin at Madison. While these universities have much in common as to educational program, business administration, and physical problems, they present four widely different pictures of physical environment.

Ohio State campus, including its 1100-acre farms, is self contained, but almost entirely surrounded by metropolitan Columbus. The University of Michigan is woven into the college town of Ann Arbor, sharing many of its thoroughfares and public facilities. The University of Illinois campus spreads over a flat prairie area between the two adjacent cities of Champaign and Urbana. At Madison the main campus of University of Wisconsin occupies a spacious stretch of territory between the northwest portion of the city and beautiful Lake Mendota.






Like many other colleges and universities these four have well-developed plans for future building which not only involve new construction and the rehabilitation of structures which are growing in obsolescence, but include expansion of campus areas, remodeling of landscape architecture and of existing buildings to meet constantly changing and expanding services to their public. These plans for future development are of long standing, and form a logical basis for the study of post-war building problems with which they are confronted.

The post-war building problems of these institutions are quite similar, even to the extent in some instances as to the kind and size of structures needed. In all four examples, the post-war programs are divided into three parts: (1) a relatively small program for execution over a relatively short period as soon as conditions will permit; (2) a secondary program for which preparations are being made for execution as funds are available, including some revenue producing structures for which public funds are not necessary; (3) the program for the indefinite future to carry out the totally developed campus plan.

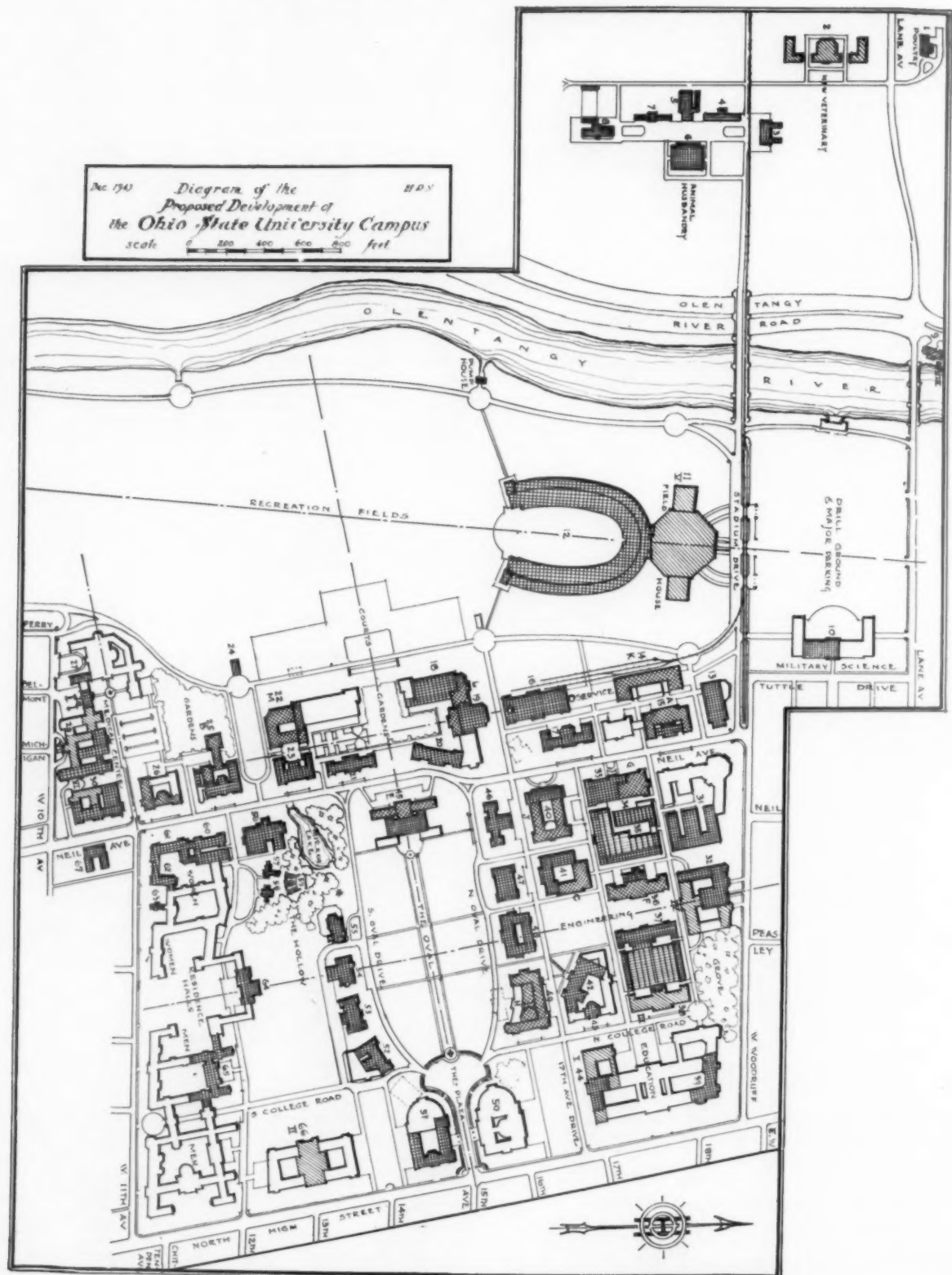
In the accompanying diagrams, building indications are as follows:—(1) existing buildings which remain, by horizontal-vertical cross-hatching and identified by Arabic numerals; (2) first stage post-war construction, by double diagonal cross-hatching and identified by letters; (3) second stage post-war construction, by single diagonal cross-hatching and identified by Roman numerals; (4) indefinite future construction, by heavy outlined blank, and (5) important existing building removed, by dotted lines.

#### • KEY TO BUILDING INDICATION •

#### • ON CAMPUS DIAGRAMS •

- 1  EXISTING BUILDINGS REMAIN •
- A  1ST STAGE POSTWAR CONSTRUCTION
- I  2ND STAGE POSTWAR CONSTRUCTION
-  FUTURE DEVELOPMENT •
-  FOR FUTURE REMOVAL •





probable issue concerning control of educational content of the so-called "education by contract" is more clearly resolved than it is at present. The merits of federal versus local control of the educational content are not within the sphere of this discussion. It is fitting, however, to call attention to the fact that the authority which stipulates the objectives and content of the educational program may be expected to exercise correspondingly important influence on the building program itself. Obviously, this last obser-

vation applies with as great force upon the privately-endowed institutions as to those supported by public funds, if not, indeed, much more so.

### *Continuation of the Educational Program*

The second assumption, i.e. that the program of higher education will continue about the same as before the war, is perhaps not so easily supported as the first assumption concerning enlarged enrollments. Those who would revolutionize the educational pro-

## Ohio State University

This diagram of a large portion of Ohio State University campus is based upon a six-months' study made in 1932 by Howard Dwight Smith, university architect, for the comprehensive development of the campus plan. It correlated previous studies made by Harry I. Williams in 1926, Prof. Joseph N. Bradford in 1920 and 1913, Olmstead Brothers in 1908, and Captain Herman Haerline, who was landscape architect for the University from 1870 to 1903.

Except for a few general assignments of areas, such as engineering, medicine, recreation, residence halls, etc., this plan was merely intended to establish basic principles for orderly development. While it has never been officially adopted by the university authorities, it is significant that no major improvement has been made in the intervening decade which has not conformed

generally to this scheme. The scheme preserves the original central oval around which many of the early university buildings were located. To this have been added the closely grouped buildings in the "checkerboard" area to the north, the recreation area to the west, the residence hall area to the south, and the medical center to the southwest.

This diagram shows only a portion of the 1100-acre farm which extends to the north and west of the main portion of the campus. University property includes the new 390-acre Don Scott Memorial Airfield, situated seven and one half miles northwest of the main campus, and a golf and archery course of 380 acres on which is located the radio tower for Station WOSU, three and one half miles also northwest from the campus.

## LEGEND

Letters indicate post-war building projects in the first stage of the program; roman numerals indicate projects in the second stage

### West of Olentangy River

- 1 Poultry
- 2 New College of Veterinary Medicine (IX)
- 3 Horse Barn
- 4 Sheep Barn
- 5 Beef Cattle Barn
- 6 Plumb Hall (Animal Husbandry Administration and Judging Pavilion)
- 7 Swine Barn
- 8 Dairy Cattle Barn
- 9 Artillery Repair Shop and Incinerator (VIII)

### West of Neil Avenue, North of 17th Avenue Drive

- 10 Military Science
- 11 Field House and Cages (V)
- 12 Stadium
- 13 Ives Hall (Agricultural Engineering)
- 14 Services, Receiving Warehouse, Food Storage, Garage, Laundry
- 15 Agricultural Laboratories Building (A)
- 16 Power Plant
- 17 Veterinary Clinic

### West of Neil, South of 17th

- 18 Men's Physical Education (L)
- 19 Natatorium
- 20 Townshend Hall (Agriculture Administration)
- 21 Horticulture and Forestry
- 22 New Women's Physical Education (M)
- 23 Campbell Hall (Home Economics)
- 24 Sewer Laboratory
- 25 Botany & Zoology (B)
- 26 Dentistry and Student Health (D)
- 27 State Board of Health Laboratory
- 28 Kinsman Hall (Medical and Surgical Research)
- 29 Starling-Loving Hospital (VII)
- 30 Hamilton Hall (College of Medicine) (VI)

### East of Neil, North of 17th

- 31 Industrial Engineering
- 32 Engineering Experiment Station and War Research Laboratory (IV)
- 33 Journalism and Radio Station (G)
- 34 Communications Laboratory
- 35 Robinson Laboratory (Mechanical and Electrical Engineering)
- 36 New Physics Laboratory (Electrostatic Generator Station and School of Optometry) (F)
- 37 Chemistry
- 38 Chemical Engineering (III)
- 39 University Schools
- 40 Pharmacy and Bacteriology and General Sciences (J)
- 41 Brown Hall (Civil Engineering, Architecture, Engineering Drawing) (C)
- 42 Lord Hall (Mining, Metallurgy, Ceramics)
- 43 Social Administration
- 44 Arps Hall (Education) (I)

### Around the Oval

- 45 Main Library (E)

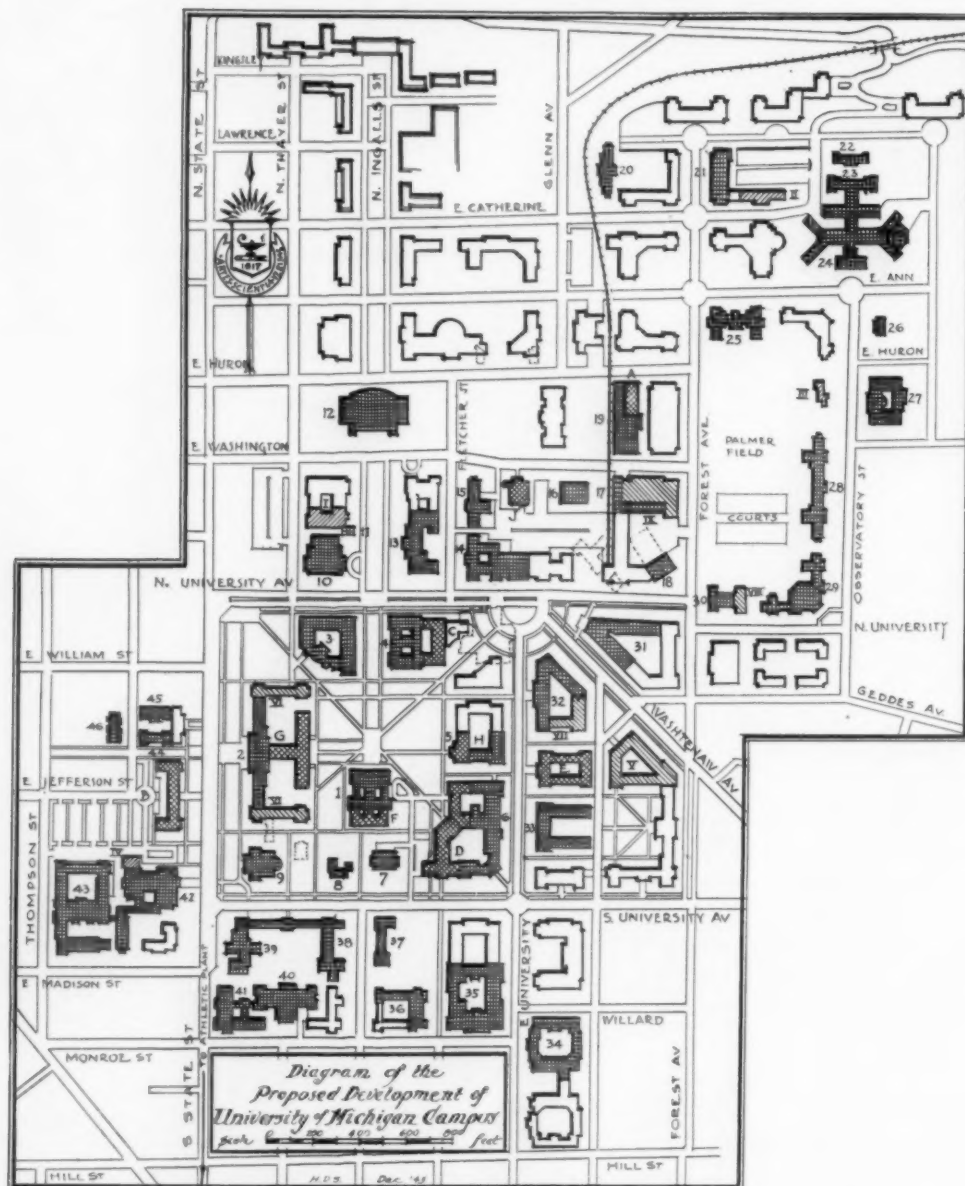
- 46 University Hall (Liberal Arts)
  - 47 Administration Building
  - 48 Derby Hall (Languages)
  - 49 Recitation Building (Music and Fine Arts) (H)
  - 50 Law and Auditorium
  - 51 Ohio Archaeological Museum
  - 52 Commerce
  - 53 Mendenhall Lab. of Physics (to be reassigned)
  - 54 Orton Hall (Geology)
  - 55 Faculty Building
- ### East of Neil, South of the Oval
- 56 Pomerene Hall (Women's Building)
  - 57 Observatory
  - 58 President's Residence
  - 59 Browning Theatre
  - 60 Oxley Hall (Women)
  - 61 Mack Hall (Women)
  - 62 Canfield Hall (Women)
  - 63 Grace Graham Walker Memorial (Home Management Laboratory)
  - 64 Old Ohio Union
  - 65 Baker Hall (Men)
  - 66 New Ohio Union and Auditorium (II)
  - 67 Neil Hall (Apartments for Women)

### Buildings Suggested for Post-War First Stage

- A. Agricultural Laboratory
- B. Botany & Zoology
- C. Brown Hall (Engineering)
- D. Dentistry and Student Health
- E. Library Additions
- F. Physics
- Power Plant Rehabilitation (Interior)
- Power Plant Equipment
- G. Radio and Speech
- H. Recitation
- J. Science
- K. Service (Foods, Warehouse, Garage-Laundry)
- L. Men's Physical Education
- M. Women's Physical Education

### Buildings Suggested for Post-War Second Stage

- I Arps Hall Additions (Education)
- II Auditorium
- Campbell-3rd floor (Home Economics)
- III Chemical Engineering
- Civil Engineering Camp (Off Campus)
- IV Engineering Experiment Station
- V Field House
- VI Hamilton Hall (Medicine)
- VII Hospital Additions
- VIII Incinerator
- Oxley Fireproofing (Women's Dormitory)
- Power Plant (Additional Equipment)
- Townshend Fireproofing (Agriculture Administration)
- IX Veterinary College



## LEGEND

In the Central Square (bounded by State St., North, East and South University Aves.)

- 1 Main Library
- 2 Angell Hall (Liberal Arts)
- 3 Natural Science
- 4 Chemistry
- 5 Randall Lab. (Physics)
- 6 West Engineering
- 7 Clements Library
- 8 President's Residence
- 9 Alumni Memorial Hall
- 10 Hill Auditorium
- 11 Burton Memorial Tower
- 12 Rackham Graduate School
- 13 Michigan League (Women's Building)
- 14 Kellogg Institute and Dental
- 15 Health Service
- 16 Laundry
- 17 Garages
- 18 Storehouse
- 19 Power Plant
- 20 Vaughan House
- 21 East Hospital
- 22 Internes' Residence
- 23 Neuropsychiatric Institute
- 24 General University Hospital
- 25 Cousens Hall
- 26 Simpson Memorial Institute

- 27 Public Health
- 28 Mosher-Jordan Halls (Women)
- 29 Stockwell Hall (Women)
- 30 Women's Athletic House
- East of East University Ave.
- 31 University Museums
- 32 East Medical
- 33 East Engineering
- 34 East Quadrangle (Men)
- South of South University Ave.
- 35 University Schools (High & Elementary)
- 36 Architecture
- 37 Martha Cook Hall (Women)
- 38 John P. Cook Dormitory
- 39 Lawyers Club
- 40 Legal Research
- 41 Hutchins Hall
- East of South State St.
- 42 Michigan Union
- 43 West Quadrangle (Men)
- 44 Newberry Residence (Women)
- 45 Barbour Residence (Women)
- 46 Student Publications

First Stage Post-War Program  
 A. Power Plant  
 B. General Service (Administration)  
 Jefferson St. at S. State

- C. Chemistry
- D. Engineering
- E. Engineering
- F. Library Addition
- G. Angell Hall
- H. Physics Lab. (Randall)
- J. Theatre Laboratory
- K. Foods Supply (not located)

- Second Stage Post-War Program
- I School of Music
  - II Maternity Hospital
  - III Henderson Co-operative Residence (Women)
  - IV Michigan Union Addition
  - V Engineering Research
  - VI Angell Hall
  - VII East Medical
  - VIII Natatorium for Women
  - IX Garage

And the following buildings for which locations are not designated:  
 School of Business Administration  
 Men's Dormitory  
 Women's Dormitory  
 School of Forestry and Conservation  
 Hospital Addition  
 Armory (Army and Navy R.O.T.C.)



gram quickly may hope that such will not be the case. For the sake, however, of discussing possible post-war building operations, it surely is safe to assume that no great revolution in educational procedure or objective will suddenly prevail immediately upon the cessation of hostilities, or even when peace is finally achieved.

We may expect, therefore, that the post-war buildings will be required to house three general types of educational objectives as heretofore, namely: (1) cultural and social, (2) research, (3) professional and vocational. We may, however, expect that more space will be required to provide for the increasing program at the bottom, in the so-called junior college level, to provide a more effectual bridge over the increasing gap between the seniors in high school and the undergraduate in college. Likewise, we must be prepared to house the increasing activities at the top in the adult education (as distinguished from the post-graduate) area. Perhaps much of this added adult portion of the program can be superimposed over the regular undergraduate activities in the building facilities which will take care of that program.

Most well-designed college and university buildings, except, of course, those built for very special programs requiring complicated construction and highly specialized equipment, have been planned and built for a degree of flexible use which has allowed for progress (or at least for change) in educational program. In the fields of arts, letters, and social sciences, this flexibility of use has not been hard to provide and maintain. It is comparatively easy to take a large classroom used in the languages, for instance, and divide it into a number of private offices or studies for the increasing staff. In many technical schools, large open factory-like spaces may be changed almost overnight from research laboratories in electronics, for instance, to lecture and demonstration space for chemistry or autodynamics, or even into warehouse space for the institution's service departments. Administrators will appreciate the significance of this flexible quality in a building, since it reduces the amount of space which may be forced to lie idle because of unavoidable obsolescence.

### *Housing New Phases of the Educational Program*

The continuation of pre-war educational procedures and objectives, which always included the necessity of meeting new educational problems, suggests that there will be phases of the programs which may not be taken care of even in the flexible-use buildings just referred to. Or, this may suggest that flexible-use buildings may need to be even more flexible. Three examples will serve to indicate the need for housing new combinations of existing activities on many campuses. The first has to do with radio. The introduction of radio into the field of higher education has come through a wide variety of channels. Often it has been developed in a department of physics because of the electronics involved, or if the actual operation of a station were involved, it has been developed in a department of electrical engineering. Often it has been developed in a department of English, where emphasis is placed upon preparation of script and presentation of broadcasts. Radio at the present, however, covers such a broad field in the educational program that facilities have to be provided for combination of efforts from at least seven areas already housed in most large universities. Physics and electrical engineering are interested in the mechanics of production and broadcasting; speech (English, dramatics and diction) in building the program, preparation of script and vocal presentation; physiology and medicine in the mechanics of the voice and of hearing; psychology and education, in the content of the educational programs; music, in co-operating with program building; commerce, in the preparation of effective advertising material; and the university administration which is interested in the whole field of public relations.

The second example refers to the combination of effort which has developed in the field of nutrition. At least four well-recognized divisions in many universities work in this area, and unless some proper building facilities are provided for their co-operation, their several separate efforts may be dissipated or be less effective than they might otherwise possibly be. Agriculture, in several of its many branches, is interested in food production; commerce and industry, in

### University of Michigan

This diagram of the main portion of the campus of the University of Michigan is based upon a map showing its proposed development, included as Exhibit 4 in the Post-War Public Works. Program prepared and published in 1943 by the University Building Committee, for the Michigan Planning Commission.

While the whole campus is knitted into the City of Ann Arbor by the checkerboard of streets and avenues which the University and the city use in common, this scheme for future development contemplates logical integration of physical plant

around the expanded library building which is located near the center of the large 1200-foot square city block. From this center the various activities of the University radiate in nearly every direction, the farthest being the medical center about two-thirds of a mile to the northeast, and the extensive athletic plant, a similar distance to the southwest.

The material referred to was prepared by the university buildings and grounds department under the direction of Professor L. M. Gram, director of plant extension.



processing and marketing; chemistry, in the physical constituents of food; bio-chemistry and medicine, in the effect of food upon human health and behavior.

The third example of expanded program which will need some sort of housing in the post-war program of most colleges and universities is in the field of international relations. The type of structure which will satisfy this program is perhaps best represented by the so-called "International Houses" at Columbia, Chicago and elsewhere. The contacts made and the interests stimulated by the global nature of World War II will make the inclusion of an international center one of the "musts" among campus buildings. This will be more than a residence hall or extracurricular center where students of all nationalities will live and play together. It will be a building in which not only departments of language, political science, geography, and the like will be interested, but also of commerce, history, art and others as well.

Other examples could be cited, but these three are sufficient to indicate the possible extent to which the post-war program may be called upon to house continuing and expanding educational needs. In considering the post-war building program in the abstract, therefore, as an important consumer of post-war man-hours, it must surely not lose its significance as a tool which must be properly designed to implement post-war educational programs.

### Comprehensive Campus Planning

#### *Starting Anew*

Two schemes present themselves for consideration in preparing a program for post-war construction. One is, to start anew in the study and development of campus requirements. By this scheme, existing facilities may be disposed of and entire institutions planned to meet new needs on new sites, or certain parts of an over-all program concentrated in existing buildings, and other parts of the program set up in new environment. There are important existing examples of the application of this scheme, such as University of California, Duke University, Rochester University, Wheaton College, and scores of others. Starting over has certain advantages which always come

from a clean slate, as it were, with the stimulation which comes from the fresh approach and freedom from physical limitations. This freedom will be an important one after the war when new materials and new construction techniques will be available and can be used more readily in buildings where conformity to existing architectural conditions is not required. It has, however, the limitation which comes from a break in sentiment or tradition, which in some institutions is an appreciable one. More specifically it requires a large financial outlay to start the development of a new site with landscaping problems, new services, and new utilities. The financial outlay may be a definite limitation.

#### *Development of Existing Campus Plans*

The second scheme, and the one which fits the realistic situation in which most institutions find themselves, is that which expands and adds to existing facilities. This scheme has the advantage of dealing with a going project, in which satisfactory existing features may be continued, unsatisfactory features altered or eliminated, and centralized administration and services may be used as a basis for planning. Those institutions which have carried on continuous studies for the development of comprehensive campus plans over a period of years will now find themselves in the fortunate position of being able to pick a post-war building program from the studies which have already been developed.

The process of study which establishes basic groupings and orderly arrangements of buildings to satisfy growing needs, based upon the existing campus layout, proposes additions to some buildings, adds new buildings at some points, suggests the gradual demolition of obsolete structures, and the rationalization of certain existing buildings into the developing scheme. Where such studies have been made it is not necessary to take snap judgment as to size and location of projects which would make up a post-war program. Rather, the post-war program becomes simply an important incident in a previously digested over-all scheme of things. Of the many institutions which have such programs in operation, four are referred to here to illustrate the point that basic pre-war plan-

### University of Wisconsin

This diagram is based upon Maps IX and XI of "A Campus Development Plan for University of Wisconsin," published in 1941, by the Wisconsin State Planning Board. Preceding plans of 1907 and 1927 have been merged into this one, which preserves the unique topographical features of the area along Lake Mendota, about one mile directly west of the center of the capital city of Madison. This plan became necessary to give orderly direction to the extensive building program proposed to the State Legislature in 1941, and is depended upon to locate projects which make up the university's part in Wisconsin's post-war program. "The plan provides for a compact grouping of related activities, with seemingly adequate provision for expan-

sion of each on sites adjacent," and "ample open spaces are maintained within the developed areas." The uniqueness of the site, between the city on the south and the lake on the north, requires major expansion to the west. This diagram indicates that the westerly expansion is absorbed by new construction for the College of Agriculture.

The Planning Commission credits A. W. Peterson, comptroller, and A. F. Gallistel, A.I.A., superintendent of buildings and grounds for the university, State Architect R. C. Kirchoff, and State Chief Engineer C. A. Halbert, for contributing to the development of the 1941 plan.





ning is a most effective basis for post-war construction.

#### *Four Examples of Pre-war Campus Planning*

The campuses of Ohio State University, and of the universities of Michigan, Wisconsin and Illinois represent four aspects of the same problem of growth and development of an institution of higher education. The cycle is typical: (1) modest beginnings in the early or middle part of the nineteenth century, (2) informal expansion, building by building until the early nineteenth hundreds, (3) phenomenal growth in the twenties followed by (4) a realization that physical growth must be guided by an orderly far-sighted plan. The diagrams shown here may be referred to as "master plans," although such a term should be used with reservations, since they should be subject to continual re-study to meet the changing requirements of a progressive educational program. In each of these four examples, groups, centers, axes or "spheres of influence" (to borrow a current city-planning term) are established, in which or around which building forms may be arranged in orderly fashion even long before the actual demand for new buildings develops. There is also evidence in these four plans that a progressive scheme of replacement and relocation is provided, so that even during the long process toward ultimate accomplishment the campuses present an orderly and, in the main, a pleasing appearance. Incidentally, to this end, when large buildings, planned for important locations, are built section by section over a period of time, no section should present wholly unfinished or unsightly ends or sides. Too often the time schedule for completing later sections of such structures is interrupted and whole college generations pass through the institution in an environment of incompleteness.

#### **An Outline of Procedure**

While large scale planning stimulates forward thinking and presents a challenge to make each piece of new construction part of the total program, there are certain details concerning the present phase of planning for the post-war period which must be referred to in conclusion. They may be set down here as cautions which should be observed:

1. Prepare a comprehensive campus plan if one does not already exist.

2. Cooperate with other groups, public or private, in establishing equitable priority for consideration and execution of projects.

3. Carry a proper percentage of the projects to the "blueprint" stage, so that at least a part of the program may be ready to go on "V" Day. This percentage will depend upon the total volume involved for any given institution, but the country as a whole will need sufficient volume to insure employment of released manpower, and those projects which are ready will surely be called upon to furnish this employment first.

4. Since a limiting factor in reaching the "blueprint" stage is the present lack of manpower in architects' organizations, the choice of the most important projects for first consideration should be carefully made.

5. Similarly, the limitation of actual available cash on "V" Day should influence the choice of the important projects to be started first.

6. Since most colleges and universities have central power plants, it is important to consider the relationship of its capacity to an expanding building program and to provide adequately for increased facilities in advance of the demand for service.

7. Projects which are carried to the "blueprint" stage at present will be based on the use of present limited or critical available materials and methods of construction. Obviously, they will not have the advantages of newly discovered materials and of new or improved methods of construction. If such projects are not used to provide "V" Day employment, but are held for later construction, they should be redesigned, otherwise they would run the risk of being obsolete as soon as they are built. This caution becomes more important each day the war continues.

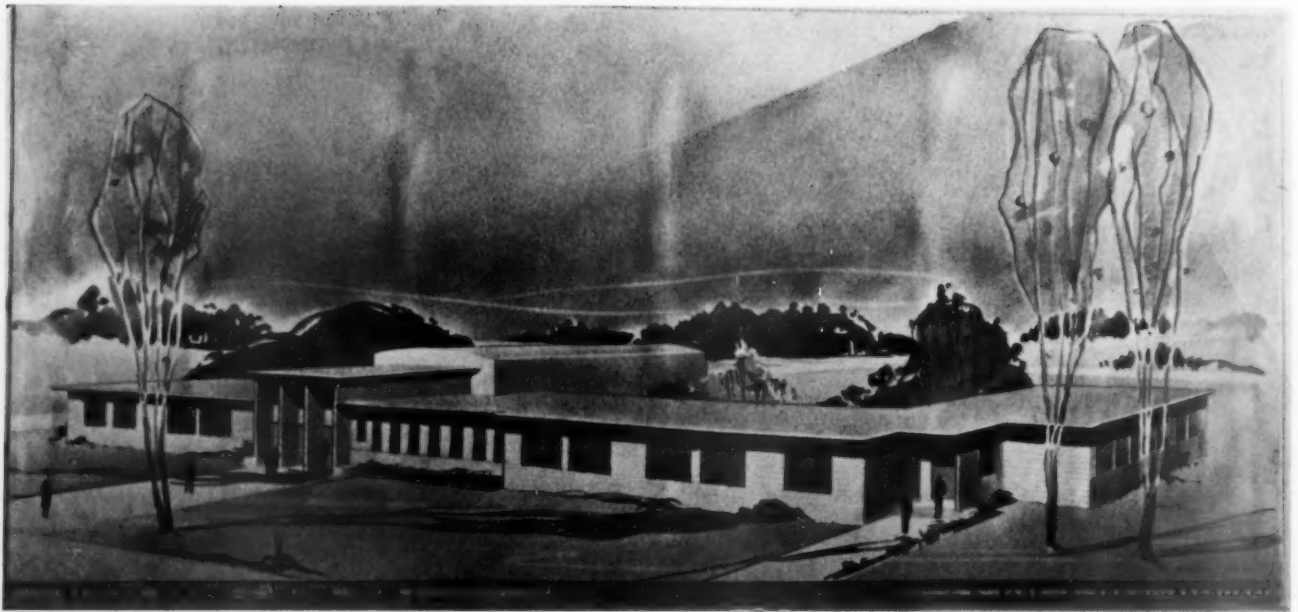
8. While there is undoubtedly a place in college and university construction for experimentation with new and untried materials and methods, and toward which a liberal attitude should be maintained, a conservative attitude toward structural stability and long-lived physical plant suggests that basic research be confined to experimental operations inside the laboratory and not be used too freely on its construction.

#### **University of Illinois**

This diagram is based upon a comprehensive plan prepared in 1933 by Charles A. Platt, architect, and Ferruccio Vitale, landscape architect, collaborating with Prof. James M. White. The original university area now known as the north campus is the narrow strip extending northward between the cities of Urbana on the east and Champaign on the west. The broad simple rectangularity of the newer south campus, both as to layout of roads and as to size and shape of buildings, suggests a magnificence of scale quite in keeping with the flat expanse of prairie over which the university has expanded for the past generation. A number of buildings have been erected on this south campus in the past twenty years. It is into these wide open spaces that the military and recreation activities have gone

and into these pre-determined rectangles the buildings of the post-war period will be placed. The College of Agriculture, its buildings and barns, occupies some 1146 acres immediately to the south of the area included in this diagram, mostly within the two mile radius from Illini Union at the Greene Street entrance to the north campus.

Of particular significance is the fact that the exteriors of the buildings of the south campus and of most of the recent construction of the north campus are designed in a simple Georgian style, inspired by Mr. Charles A. Platt and built under the direction of the late Professor White, former university architect, and Mr. E. L. Stouffer, present university architect.



## LESSONS FROM THE LANHAM ACT FOR SCHOOL PLANT DESIGN AND CONSTRUCTION \*

By LEONARD POWER

Educational Consultant

WITH but few exceptions Lanham Act schools were designed and constructed in haste. Those constructed early during the program followed conventional patterns. Later buildings followed a standardized set of plans, with necessary adaptations to site topography, orientation, and other conditions. The time of their completion seldom synchronized with the time of arrival of the host of war workers. Delays were often due to the time lost while unwinding the governmental red tape of duplicating and overlapping federal paper work required to determine

needs. There were many limitations on the materials available for use. The War Production Board required 200 per cent utilization which resulted in buildings having but one-half enough classrooms to meet normal standards. Under such conditions it is not to be expected that much of lasting value will be learned about school plant design and construction. Nevertheless, these experiences have taught some valuable lessons.

### Advantages of Temporary Schools

*Lesson Number 1: "Temporary" schools may meet future standards for permanency.*

Lanham Act funds were intended to be used for construction of temporary schools only. But anyone who has seen these schools knows that the word "temporary" is a misnomer. Many Lanham Act schools will be in use in 1965 or thereafter. By that time, improvements in design and changes in function will have been so numerous that new buildings will be required. The voters of that day will be more inclined to approve the necessary capital investment in new buildings than they would be had the Lanham Act buildings been of a more permanent type of construction.

\* The Lanham Act was approved on October 14, 1940. This act provided federal funds for the construction and the maintenance and operation of community facilities in areas in which there was a considerable influx of population due to the expansion of war industries and to the construction of military establishments. Schools were regarded as desirable community facilities, and federal funds were provided where the war need, therefore, was clearly developed.

This article is based upon Dr. Power's experience in the U. S. Office of Education where he served as consultant on school building needs for six months before becoming a member of the staff of Senior Specialists on School Facilities which covered the United States for two years, under the direction of Henry F. Alves.

In cooperation with local and state school officials, Dr. Power made surveys of school needs in such war areas as Detroit, Michigan; Norfolk, Virginia; El Paso, Texas; and war areas in Arizona, California, Colorado, Mississippi, Nevada, New Mexico, Oregon, Utah, and Washington.

In addition to his field surveys, Dr. Power examined many applications and school building designs received in Washington, and assisted in the preparation of certificates of necessity for the signature of Commissioner John W. Studebaker.



Temporary buildings need not be unattractive, even though they follow a conventional pattern. In many communities the Lanham Act schools are more attractive in appearance than are the older schools.

A catastrophe awakened Californians to the hazards of a certain type of school construction. Following the earthquake scare of 1933, children were moved out of masonry units into inexpensive cottage-type classrooms. Superintendents were amazed at the enthusiastic reports of school teachers on the advantages of this type of unit over a central building. Inaccessibility of offices, toilets, and other inconveniences seemed to the average teacher a small price to pay for the advantages she felt in her cottage classroom.

A similar situation growing out of the war is developing in many parts of the United States with regard to war-type demountable classrooms. However, these classrooms are quite superior to the temporary or portable units used in the past. They have more glass than traditional rooms and most of them are 40 feet long and about 23 feet wide. A low plate height has been used, but good natural illumination has been achieved by the use of bilateral and glare free lighting. There is less complaint about eyestrain than under the old standards of unilateral lighting, provided, of course, that the roof projects far enough to cut off some of the direct rays of sunlight. Furthermore, sloping roofs, light ceiling color, and low ceilings are advantageous to both lighting and ventilation.

Demountable or prefabricated schools, with the

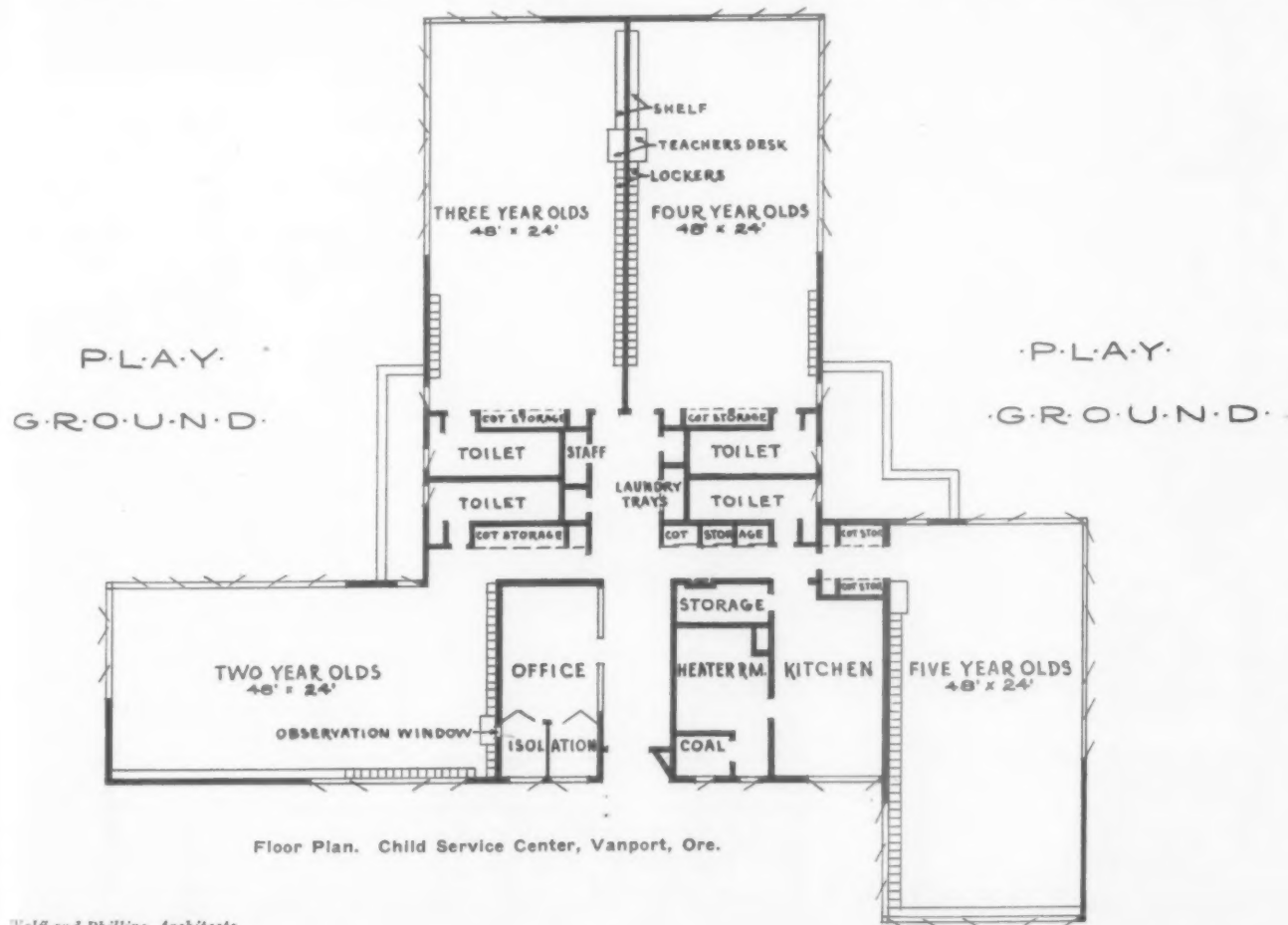
classrooms grouped in either an original or in a conventional pattern, have several advantages. For instance, an over-estimate of the child population in San Diego resulted in the construction of a demountable school having several more classrooms than were required. This school was made up of a series of units of two or three classrooms each. The excess units were moved to another housing project where they were reassembled and found to be thoroughly satisfactory. This demountable school was constructed of inside and outside walls and ceilings of 4' x 8' plywood panels.

The lesson to be learned from the best of these one-story temporary schools is that such construction may be sufficiently permanent to meet all of our needs; they may enable boards of education to make more frequent replacements at much less cost, and they have the quality of flexibility required for making necessary alterations and additions to meet changing school needs. Any other type of construction may one day before long be considered too expensive and wasteful from the long-term point of view.

#### Extended School Services

*Lesson Number 2: Lanham Act schools may set the pattern for community educational service.*

*Lanham Act nursery schools illustrate the demands which have been made by wartime conditions upon the resourcefulness and inventive genius of architects,*



engineers, and educators. They are unlike typical pre-war nursery schools. They are not small. Instead of providing pre-school care for a few over-privileged or a few under-privileged children, they include provisions for all of the pre-school age children of working mothers, and most mothers work in war centers.

There was not much that architects, engineers, or educators could learn from either the lavish provisions of privately conducted or experimental nursery schools, or from the most meager provisions of the typical child care center. The nursery school, or child service center as it is called at Vanport, Oregon, is a good illustration of making mass provisions for the youngest children. This building provides facilities for 140 children. In addition to the necessary service rooms and offices, it has four large combination sleeping and playrooms; it provides ample cot storage space, locker space and a laundry and kitchen. An isolation ward with an observation window is also provided. The community in which such facilities are regarded as a wartime expedient may learn from them. The effect of the child service center on the pre-school child's personality may be such that these provisions will never be given up, and the effects will be felt by many other nearby and remote communities.

The nursery schools at Vanport are exceptional but all Lanham Act schools make some provision for the care of pre-school children.

*Extended school service* must be provided in many war centers. Such services include all activities, outside of regular school hours, for school age children of working mothers. Had the War Production Board realized the extra demands that would be put upon the schools, it would have much sooner lifted the famous ruling that schools must be utilized up to 200 per cent of capacity. In addition to providing for pre-school children and for extended school service, Lanham Act schools in war-created communities must provide for the education, the vocational training and retraining of adults, and for a part of the recreational program for adults. Such communities are labora-

ories for the community schools of the future. For instance, at Vanport, each school provided library, auditorium-gymnasium, and cafeteria service for the whole community. The schools are open from 5:45 A.M. to as late at night as may be necessary. When the whole community uses the school plant, the whole community is more likely to understand its possibilities as an instrument of education.

## School Building Specialists

*Lesson Number 3: Be prepared.*

This lesson and the one which follows may seem out of place in this article, since both of them are only indirectly related to school plant design and construction.

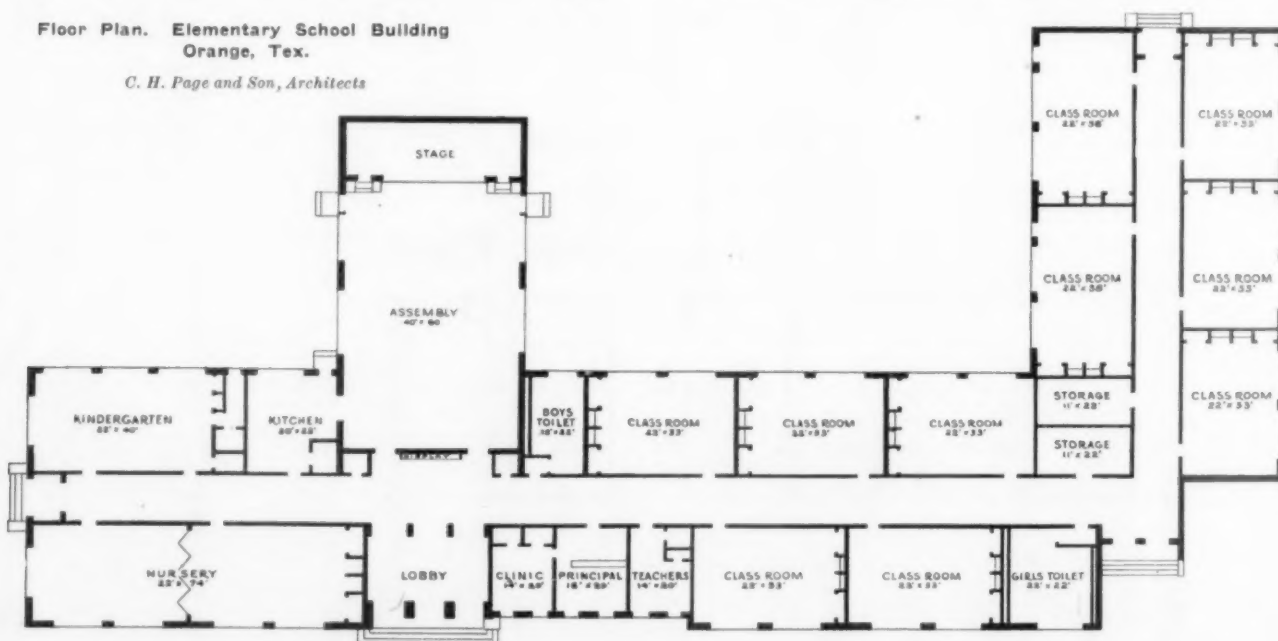
In general, the emergency caught many local school officials with their *plants* down, and without any designs on hand either for new buildings or for additions to existing buildings. Those who were so caught will not again wait. Teachers and civic leaders will share in the planning, and they will correct specific inadequacies of existing buildings.

More states will regard the planning of school buildings as a function sufficiently important to require a specialist on the staff of the chief state school officer. Those states having school building specialists got better Lanham Act schools, and the schools were better related to over-all community needs. Most of them had county maps showing the location of all schools, and district maps showing where every child lived.

At first sight, it would seem that detailed information, such as spot maps, would be needed only in cities. On the other hand, many rural areas were affected. Some lost more children than they gained, due to the location of military camps. Others gained, in a string-town fashion, particularly those districts adjacent to large military establishments. String-town developments are the most difficult to forecast. On the other hand, the available transportation for

Floor Plan. Elementary School Building  
Orange, Tex.

*C. H. Page and Son, Architects*





Interior of prefabricated classrooms showing clerestory lighting, San Pablo, Calif.



Reprinted from *NEW PENCIL POINTS* by permission of architects—Franklin & Kump

children residing on or near highways in rural areas saved the day, and Lanham Act schools were perhaps more appropriately located in many rural districts than they were in cities. This may be a useful hint to cities having available large school sites in outlying districts.

Some states entered the war period with long-term master plans, developed in cooperation with local school districts. These plans were often unknown to the federal official and even when known they were sometimes ignored. For example, a certain school district had a master plan for a junior-senior-junior college plant on a large campus. On the basis of that plan, Lanham Act financed units were given a specific location. Regardless of these facts, for reasons satisfactory to Federal Works Agency alone, the Lanham Act units were located on a site about which the state department of education had not been consulted.

The above may seem, at first sight, to have little relation to school plant design but in a way it has. On several occasions state school plant officials have happened in on situations just in the nick of time to prevent the adoption and application of a national-war-time solution for each of several size school buildings. Had that been accomplished, the most important aspect of a school building program, namely, that of fitting the design of the school to the particular

needs of the community, would have been set back substantially.

With the few exceptions noted above, faulty location of school sites or inadequate new school buildings constructed with Lanham Act funds were due much more to the conditions under which everybody worked than to the incompetence of anyone. After having worked with many Federal Works Agency engineers, it is apparent to the author that much of the blame, where there was any, should rest upon short-sighted or lazy school officials. It was they who failed to exercise the leadership of their positions. It was they who resented the intrusion of a war which dared to upset their comfortable administrative routine. Fortunately, such persons are not typical, and many superintendents have learned that in order to meet emergencies, it pays to be prepared and to have the courage to fight for well-considered plans. One superintendent writes:

Our experience with the Lanham Act, both from the standpoint of construction and child care and regular maintenance and operation has been very satisfactory. We have found in our construction program all the freedom of construction that we would have had had we been building with our own funds. In every instance the recommendations of the Owner and the Architect were accepted in regard to planning and arrangement of the buildings.





#### By-passing of the States

*Lesson Number 4. He who pays the fiddler calls the tune.*

The Federal Works Administrator is paying the fiddler in this case. In administering the Lanham Act there has been a growing tendency to by-pass all intermediate agencies to deal directly with the applicant. Federal Works Agency officials have tended to regard the determination of the need for schools and their design very much as though the schools were federal buildings such as post offices. This tendency culminated on August 12, 1943, on which date a memorandum to the President was signed by the administrator of the Federal Works Agency, the administrator of the Federal Security Agency, and the director of the Bureau of the Budget. This memorandum specified that—

The Federal Works Agency is equipped to determine the need and extent of need in cooperation with local governments. The Federal Security Agency has not heretofore been called upon for recommendations regarding PWA, WPA, or other school construction projects, and has no responsibility for standardizing such facilities. It is agreed that no recommendations by the Federal Security Agency will be required for these facilities.

It is not appropriate in an article on school plant design and construction to dwell at length on administrative policies, but the passing of the Office of Education as a cooperating federal agency in the determination of needs for schools is significant to educators.

There is a tendency substantially to weaken state programs when a federal agency engaged in building

schools deals directly with local governments and by-passes the state as an intermediate agency. This is particularly true in those states which have well-developed divisions of architecture and/or divisions of schoolhouse planning. In such states much thought is given to building regulations and codes governing requirements as to structural safety, resistance to seismic forces (California), fire and panic, site arrangements, lighting, hygiene, and problems of function related to teaching. For instance, in California, the Federal Works Agency has not said that school buildings should not meet State Division of Architecture standards of resistance to seismic forces. It has, however, denied the applicant funds for state plant checking to comply with those standards. Furthermore, direct dealing with local school districts may result in violating state school laws, as reported in cases where on-the-job changes were made without the approval of proper state officials.

#### What Experience Has Taught

In conclusion, the Lanham Act has taught us some valuable lessons. Among these lessons we have learned that good and workable temporary school buildings have many advantages. War-created communities are laboratories for community educational centers. Wise school administrators will not be caught unprepared again, but will consider continuous school plant planning a necessary function. Finally, we should have learned some valuable lessons about what happens when a federal agency sets out to do a job in our field.

# Lanham Act Schools

Reading from top to bottom.



Military Trail Elementary School  
West Palm Beach, Fla.  
Parkview Elementary School  
Newport News, Va.  
Elementary School  
Pine Bluff, Ark.  
Elementary School  
Childersburg, Ala.  
Willard School  
Wichita, Kan.

Emerson School  
Lawton, Okla.  
Lordship School  
Stratford, Conn.  
Elementary School  
Belmar, N. J.  
Clifton Primary School  
Artesia, Calif.  
Elementary School  
Rock Island, Ill.

*Courtesy of Federal Works Agency*



## RECREATIONAL FACILITIES FOR THE POST-WAR WORLD

By ORMSBEE W. ROBINSON

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**T**O discuss recreational facilities for the post-war world may seem to suggest that we have already determined what we mean by recreation, and what the objectives of a recreation program should be. Some critics have said that the present preoccupation with programs and facilities for recreation tends to destroy the values we seek to develop because of the excessive organization and institutionalization that have accompanied their development. There is enough truth in their allegation to warrant a re-examination of our purposes and methods. Such an undertaking is especially desirable if we wish the facilities we are contemplating for the post-war period to be consistent with sound educational policy and sufficiently comprehensive to meet the expanded needs which can already be anticipated.

### Needed Services

Resources should be available ideally in every community which would permit each individual to develop during his leisure time one or more personal interests that would contribute to his growth and development as a better human being. A corollary of this aim would be the organization of a service or guidance program which would help individuals discover their own potentialities. This service would be particularly important for men and women who have been demobilized from the armed forces. It would also meet the needs of many industrial and office workers whose regular work offers limited satisfactions and whose inability to find constructive activity after work results in their drifting into wasteful, trivial, and even harmful activities.

The justification for such an inclusive program can

be determined in terms of its contribution to the health of the community. Recreation means enjoyment of life, self-realization, growth. People who individually and in groups have resources available for use of their leisure time and who know how to use them will tend to be well-rounded, healthier, more mature citizens.

### Build Public Acceptance Now!

It is generally agreed that, because the need for recreation is so fundamental a part of living and its satisfaction so important for individual and social health, the community should accept responsibility for providing and maintaining recreational programs and facilities for all of its citizens. Many communities have recognized this obligation but even in the most progressive centers there remains much to be done.

There is also the unpleasant fact to face that during the war period many of the advances of the past decade have been casualties of aggressive, "economy-minded," special interests. That this policy of retrenchment could be successfully carried out during a time when the demands for healthy recreation were apparently so valid indicates that individuals and agencies who visualize expanded programs in the post-war period must start seeking public acceptance now.

### Contribution the School Can Make

School officials will certainly play an important part in planning post-war recreational facilities, if for no other reason than that they have under their jurisdiction the operation and maintenance of publicly owned buildings and grounds which the public may rightly expect should be used for other than nar-



rowly conceived educational purposes. In communities where the school is now serving as a community center, the wider obligations of the educational authorities are recognized and accepted. It is from such centers that other school officials can discover the possibilities inherent in their position for assuming leadership in community-wide recreation planning.

The term "leadership" is used advisedly because there is a tendency for some educators to seek sole responsibility and control of such programs. It should be apparent that no single institution can provide the leadership or the facilities which are essential for a truly inclusive plan. What is needed is some method through which all public and private facilities are coordinated in accordance with an over-all objective. The school as one of the agencies thus plans its contribution within the context of the total program.

If this position is accepted the contribution that the school can make will remain of substantial importance and its own program should be enriched. It increases the responsibility of the school to scrutinize its own recreational program to be sure that it is not negating in practice what it espouses for other agencies. For example, many school boards have under consideration plans for new school buildings, for the renovation and remodeling of old buildings, and for the improvement and extension of playgrounds and playfields. These projects should be of concern to the entire community to make sure that they contribute to the recreational and educational needs of everyone. If they should be unwisely located or designed without any thought of multiple use their completion may represent an actual loss to the community, and because of the large financial investment involved defer the development of an adequate community program indefinitely.

#### Internal School Organization

If the necessity for community-wide planning and coordination is granted, the next question is one of internal school organization and administration. It is one thing for school officials to participate in the planning of a program for which they do not have to assume full responsibility. It is a more difficult matter to face squarely the need for coordinating and integrating recreational activities within the school itself. In this connection the Educational Policies Commission of the N.E.A. has stated that "on the whole, the response of school authorities to an opportunity which is peculiarly theirs, namely that of providing certain recreation services to the community as part of a broad educational program, leaves much to be desired. Many have incorporated leisure-time activities into the school curriculum in a perfunctory fashion without stopping to realize that values which are distinctively recreational may be destroyed by a traditional approach to learning. Some have opened school buildings and playgrounds under pressure from the community without making sure that both educational and recreational interests would be safeguarded by competent leadership."<sup>1</sup> In other words if schools are to give their full measure of leadership to the community they must in practice exemplify the aims they propose.

<sup>1</sup> National Education Association and American Association of School Administrators, Educational Policies Commission, *Educational Policies for Community Recreation*. Washington, D. C.: The Commission, 1940. P. 19.

L. P. Jacks, in his book, *Education through Recreation*, makes the statement that "the education which is not also recreation is a maimed, incomplete, half-done thing. The recreation which is not also education has no recreative value."<sup>2</sup> The implications of this observation could profitably be explored by every teacher and administrator. It is true that in recent years physical education programs have been conceived in broader terms. It is also true that music and art have been incorporated into many school programs along with other activities of recreative value. Unfortunately, however, many significant activities are still classified as extracurricular, suggesting to the student and to the outsider that they are less worthy of serious effort and attention than "regular" classroom activities and could be dispensed with without undue violence to the growth and development of the student. The fact that for many students these activities are more meaningful than any others they experience within the school and elicit their best powers should raise some embarrassing questions. If we have really accepted the teaching of the "worthy use of leisure" as a function of education, what is the matter with many teaching programs today? Even a casual examination of every subject area should suggest possibilities for making explicit recreational values that too often remain submerged.<sup>3</sup>

In preparing plans for post-war recreational facilities it is therefore desirable that the school formulate its contribution in relation to community-wide resources and in cooperation with all agencies whose aims are compatible and at the same time that it fully explore, develop and coordinate its own program so that its total contribution will be commensurate with the best that it has to offer.

#### Extension of School Facilities and Programs

Each community must of course determine as best it can its own needs for the post-war world. To meet those needs some facilities are already at hand, among them school properties. The task is then one of extension. A group of Eastern secondary school principals have recently recommended that for purposes of planning "a very definite and practical extension of recreational activities" the following four groupings might serve as a convenient guide for school officials in formulating such a program:<sup>4</sup>

1. Extended use of public school indoor facilities.
2. Further use of school playground, park, and other facilities.
3. Development of all types of artistic, musical, and literary programs.
4. Development of hiking, camping, youth hostels, day camps, and trips.

1. *Extended use of public school indoor facilities* may present more difficulties than any of the others and the success of the third line of approach is certainly closely dependent on whatever decisions are made with respect to the design and use of buildings. Most school structures were not designed for multi-

<sup>2</sup> L. P. Jacks. *Education through Recreation*. New York: Harper and Brothers, 1932. P. 2.

<sup>3</sup> For an interesting discussion of this problem, see Laurentine B. Collins, and Rosalind Cassidy. *Physical Education in the Secondary School*. New York: A. S. Barnes and Co. 1940. Pp. 69-77.

<sup>4</sup> Oscar Granger. *Leadership in Secondary Education*. The Bulletin of the National Association of Secondary School Principals, November 1943, Vol. 27, No. 117. P. 30.



Another room might be set aside for ping-pong



The multiple use of art rooms, shops, and laboratories is often discouraged because of the lack of storage space for materials and current student projects

Once school officials are convinced that after-school use of the building is of equal importance . . . the school will have taken an important step toward becoming a community center

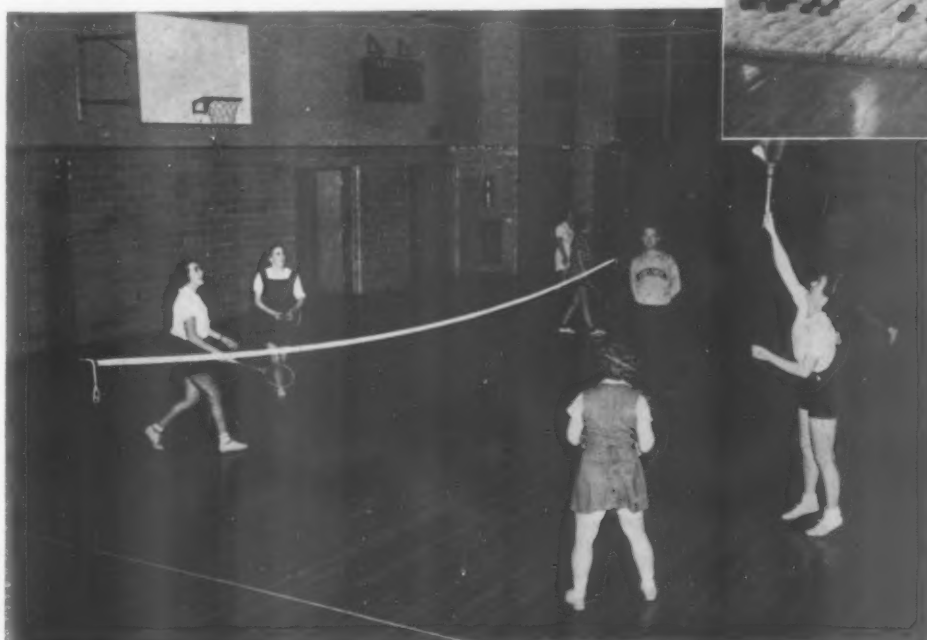




The recreation which is not also education has no recreative value

The public must be educated and helped to understand that good recreation is a necessity not a luxury

Some have opened school buildings under pressure from the community without making sure that recreational interests should be safeguarded by competent leadership





ple use and lack both the equipment and space for informal or creative activities. Even where these limitations are not insurmountable there remains the more delicate task of overcoming the reluctance of some principals, teachers, and janitors to assume additional responsibilities. The resistance of this group has too often been accepted by the public to the disadvantage of both school and community. Where it exists it will require a two-fold educational campaign—one to reeducate the school staff, the other to reeducate the public to what the school has to offer.

If public use is to be encouraged after school hours the interior of the building must be made attractive. There should be an atmosphere which is bright, colorful, and relaxing in its effect. Plans for renovation and remodeling should include setting aside one or more rooms and furnishing them with comfortable chairs and with small tables for games. Current magazines and newspapers should be on hand. Smoking should be permitted. Another room might be set aside for ping-pong, another for small group meetings with a movable blackboard. Such a recreation "suite," if space is very limited, could well be reserved for students during the day.

The multiple use of art rooms, shops, and laboratories is often discouraged because of the lack of storage space for materials and current student projects. A beginning could be made in at least one of these rooms by building in extra cabinets.

Once school officials are convinced that after-school use of the building is of *equal* importance to its conventional use from "nine-to-three" such alterations and changes should not be too difficult to incorporate

and the school will have taken an important step toward becoming a community center.

Every new school building should certainly be designed for joint school-community use. Failure to do so would represent a tragic misapplication of public funds. When plans are being drawn up it probably would be wise to have recreation authorities go over them carefully and make specific recommendations. The National Recreation Association, for example, suggests that "school buildings designed to serve as major indoor recreation centers for the people of a community should provide all of the essential features of a recreation building, even though some of these may not be required for regular day school use."<sup>5</sup> Most of the following facilities they consider as essential for a recreation building and therefore for a community-centered school:

Gymnasium with seats for spectators, lockers and showers, suitable for basketball, volley ball and other floor games, gymnasium classes, and dances, socials, holiday celebrations and similar activities.

Assembly hall or auditorium with stage, and preferably with removable seats, for concerts, lectures, movies, dramatics, rallies, banquets, recreation demonstrations and community gatherings.

Room for informal reading and quiet table games, where an individual may drop in for a few minutes or spend an evening with one or more friends.

Room equipped for various types of arts and crafts activities.

Social or play room for small group parties, square dancing, play rehearsals, and other activities involving fairly small groups.

Room for table tennis, billiards, darts, shuffleboard and active table games.

<sup>5</sup> National Recreation Association. *Standards for Neighborhood Recreation Areas and Facilities*. New York: The Association, 1943. P. 10.



Further use of school playground, park, and other campus facilities will probably demand more intensive use of present facilities and in many cases the acquisition of additional equipment and space

Two or more club or multiple-use rooms for club and committee meetings and hobby groups of all kinds.

Refreshment stand or snack bar.

Kitchen for preparing meals and simple refreshments and also for cooking and canning classes.

Office for the director.

Essential service rooms and facilities including ample storage spaces for equipment and supplies.<sup>6</sup>

A further recommendation is that these facilities should be available for community use throughout the year.

Important as the inclusion of many of these facilities may be in plans for new buildings, it is of equal concern as to where they are to be located. If they are scattered throughout, there will be added maintenance costs which might soon prove prohibitive. To meet these administrative and maintenance problems some authorities recommend that most of the facilities which are to be used by school and community be concentrated in a separate section or wing of the building. Others recommend that they be located in a separate building on the school campus.

2. *Further use of school playground, park, and other campus facilities* will probably demand more intensive use of present facilities and in many cases the acquisition of additional equipment and space. It is particularly important that any changes in these facilities be the outgrowth of a community-wide plan that has taken into consideration such factors as anticipated population movements, business trends, and so forth.

Space requirements for playgrounds should be based on the population of the neighborhood which it is to serve. The following figures<sup>7</sup> may prove helpful:

Present or Estimated Future Population of Neighborhood	Minimum Size of the Playground Needed
1,000 .....	2.75 acres
2,000 .....	3.25 acres
3,000 .....	4.00 acres
4,000 .....	5.00 acres
5,000 .....	6.00 acres

These recommendations may seem to be unreasonably large but they represent space that is to be developed for use by the entire community. Smaller playgrounds than those envisaged would have to have their use restricted to specific age groups, and equipment needs would be limited accordingly.

If, however, school authorities are in a position to plan playground areas in accordance with these specifications, provision should be made for most of the following features:<sup>8</sup>

Corner for pre-school children.

An apparatus area.

An open space for informal play.

Fields for games such as softball, modified soccer, and touch football.

Courts for tennis, handball, horseshoes, paddle tennis, volley ball and other games.

An area for quiet games, crafts, dramatics, and story-telling.

A corner for table games and other activities for old people.

Shelter house.

Wading pool.

The more elaborate playfield facilities which are usually planned for use of the junior and senior high school students should also be surveyed. If the present site is less than 10 acres in size it could well be expanded up to that minimum at least. If new sites

are to be purchased the possibility of acquiring from 15 to 20 acres should be given every consideration.

Recreational planners recommend that the modern playfield should also be considered as an outdoor community center and should therefore have most of the following features:<sup>9</sup>

Children's playground.

Areas for several major field games and sports for men and for women.

Courts for tennis, shuffleboard, bocce, badminton, volley ball and other games.

Lawn area for such activities as croquet, archery, clock golf.

Swimming pool.

Outdoor theater.

Center with council ring for day camping.

Picnic center for small groups.

Facilities for winter sports.

Recreation building.

Parking area.

School officials may feel that the program that these facilities would require if they were to be used effectively is far too broad and extensive for them to even think of undertaking. A good case could be made for such facilities for the use of school children alone, but their validity as part of a community-wide program should be unquestioned. In the latter instance the argument for their adoption rests on broad considerations of community health and welfare in which schools certainly have a major interest to protect and further. While it is apparent that many communities could not afford to construct or maintain such recreational facilities without outside financial assistance, the standards recommended by the National Recreation Association should provide all community planners with a sense of direction and a broadened perspective.

3. *Development of all types of artistic, musical and literary programs* will as previously suggested be in some measure dependent on the indoor facilities that the schools can provide. There will also be the problem of equipment and materials that should be available at little or no cost.

Leadership will be of primary importance in every phase of the school's recreation program and especially so in this type of activity. Recreational values are not always accepted as worthy by classroom teachers. Their attitude may be endured by the average student but it would quickly stifle any interest that an adult might have had. While the school may be in a position to offer the right kind of leadership to meet some of these needs, there should be no hesitation in drawing upon professional and lay sources outside of the educational fraternity for additional help. The results of such collaboration would probably be of mutual benefit to all parties concerned.

4. *Development of hiking, camping, youth hostels, day camps, and trips* as part of the school's responsibility may seem on first thought to be invading the prerogatives of existing private agencies. The concept of the community-centered school, however, suggests a two-way process. The community comes into the school and the school goes into the community. These activities are essential if this objective is to have any meaning in the life of the student, and therefore they should all be considered as part of the educational program.

<sup>6</sup> *Ibid.* P. 8.

<sup>7</sup> *Ibid.* P. 4.

<sup>8</sup> *Ibid.* P. 5.

<sup>9</sup> *Ibid.* P. 6.

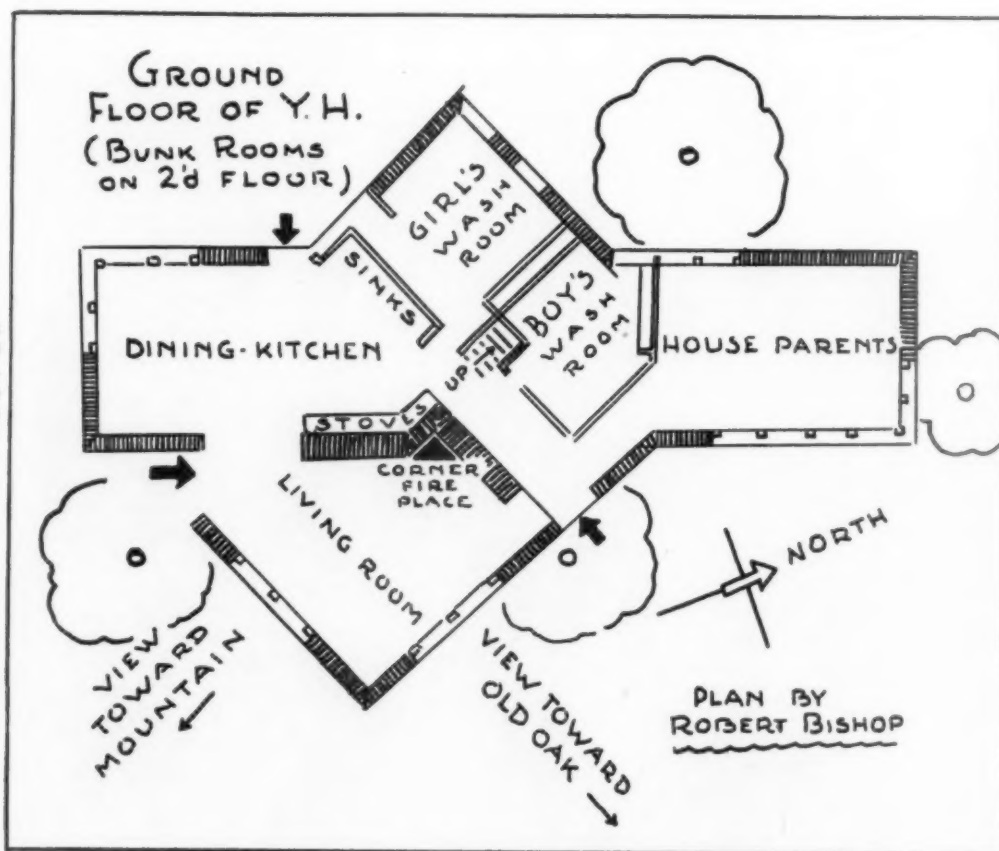
Facilities for many types of informal learning experience are already at hand. For small children a trip to the neighborhood store can be exciting and informative. Older children will enjoy a visit to the local department store or a factory or mill. Day camping on week-ends or during the summer months would be facilitated through some of the recommendations that have been made, but certainly is not dependent upon them.

Hiking is another activity which can be of great educational as well as recreational value. If trips of more than one day are to be sponsored the question of over-night facilities becomes important. In many sections of the country youth hostels are located conveniently near urban centers. Most of these have been established by American Youth Hostels, Inc.,<sup>10</sup> "a non-profit organization to aid youth in healthier, happier living and in a greater understanding of the world through the cultural benefits of travel." Hostels, as a matter of policy, are open only to those who travel "under their own steam"—hiking, biking, skiing, canoeing or horseback riding. In many places school officials have been active in sponsoring hostels and are members of local committees. If there are no hostels in the surrounding countryside, school officials might well consider helping to organize a local committee so that simple travel accommodations would be available for informal groups of students as well as individuals.

<sup>10</sup> For further information about youth hostels, write to American Youth Hostels, Inc., Northfield, Mass.



Typical layout of numerous Youth Hostels scattered throughout the country. (Some schools have made available their housing facilities.)



Courtesy of Youth Hostels, Inc.



A good year-round educational program would have to make provisions for camping. The general report of the American Youth Commission, *Youth and the Future*,<sup>11</sup> endorses this point of view along with many other educational groups. It would be a fine accomplishment if in the post-war world schools could take the lead in working towards the development of facilities which would permit every child to have a camping experience. Obviously the objective must be thought of on a long-term basis but there is much that can be done by extending the use of present facilities.

Unfortunately many existing camping facilities remain idle from 9 to 10 months of each year. Camping could start on a week-end basis. The next step might be the organization of winter-camping parties during the winter holidays. Guidance authorities might also be interested in utilizing these sites during the regular school year for groups of children who have special health needs or emotional problems which can be dealt with most adequately in such an informal environment.

Camping needs will vary according to the age of the child or youth. Older youth will probably want experiences that are more challenging and carry more responsibility than the average camp is in a position to provide. Commenting on this problem the general report of the American Youth Commission has the following statement to make:

Adults are frequently dismayed at the lack of appreciation on the part of youth even when an abundance of helpful care has been provided. Yet it is one of the oldest facts of human nature that no amount of protective care or attention in which the recipient has only a passive part is likely to inspire much gratitude. In its field studies of youth, the Commission found a general absence of appreciation for the service rendered youth through the usual types of classroom instruction in the schools. *Conversely, the greatest amount of appreciation came from youth who had spent a summer of hard labor*

*in voluntary work camps, camps in which the young people were given real opportunities to be of service to others.*<sup>12</sup>

Since 1934 the voluntary work camps referred to have been developed by private organizations and schools for both high school and college youth.<sup>13</sup> During the war period the need for farm labor has inspired similar projects but in far too many instances schools have failed to assume any responsibility for making the work experience educative in a larger sense. Leaders of the work camp movement believe, however, that the evaluation of the best of recent experiences will lead school officials to incorporate the principal ideas of the work camp movement in their post-war educational plans.

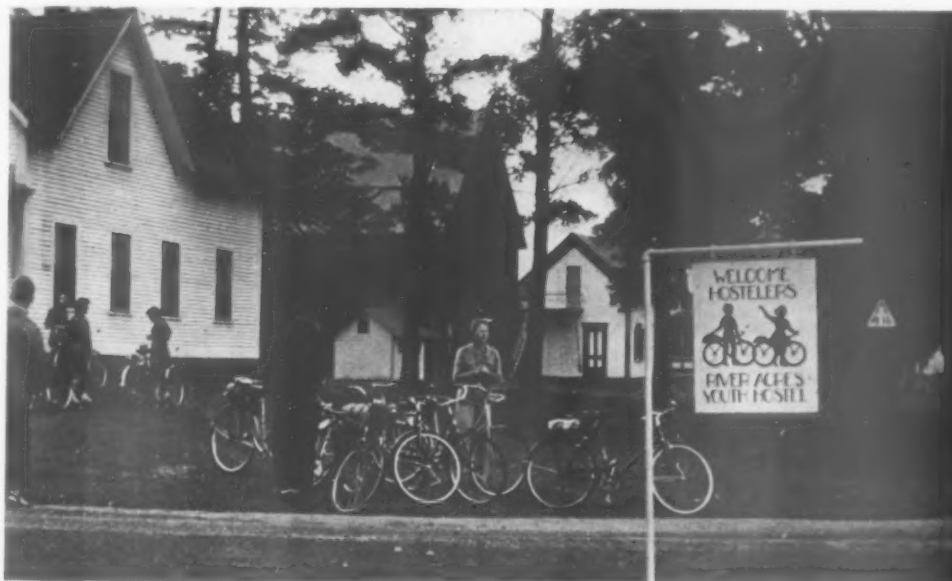
#### Conclusion

Each community must of course determine its own course of action in planning its recreational facilities for the post-war world. All of our experience during the past decade indicates that tremendous unsatisfied needs for recreative experience have and will continue to demand recognition. Those who aspire to meeting those needs must first prepare their communities so that positive action may be taken. The public must be educated and helped to understand that good recreation is a necessity, not a luxury. "Soundly conceived and properly administered, the community recreation program provides not only an indispensable service in itself but also the key to character training and to the general development of morale and patriotic citizenship."<sup>14</sup> The schools should be ready to give guidance and leadership to any such movement and to exemplify in their own organization and administration the educational possibilities that are inherent in a recreational program.

<sup>12</sup> *Ibid.* Pp. 246-247.

<sup>13</sup> For further information about voluntary work camps write to American Friends Service Committee, 20 South 12th Street, Philadelphia, Pa. and to Associated Junior Work Camps, Inc., 101 Barnett Street, New Haven, Conn. Also see the following publications of the American Youth Commission: Kenneth Holland, *Work Camps for College Students*, 1941. Kenneth Holland and George L. Bickel, *Work Camps for High School Youth*, 1941.

<sup>14</sup> *Ibid.* P. 157.



Hostels are open only to those who travel "under their own steam"—hiking, biking, skiing, canoeing, or horseback riding

<sup>11</sup> American Youth Commission, *Youth and the Future*. Washington, D. C.: American Council on Education, 1942. P. 160.

# NEW MATERIALS FOR POST-WAR EDUCATIONAL BUILDINGS

By RALPH E. HACKER

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PUBLIC imagination has been fired by stories and artists' drawings of wonderful new materials that will be available for post-war buildings. Leading industrial concerns, manufacturers' associations, research foundations, and prominent members of the architectural and engineering professions concur in the opinion, however, that no new materials of importance will be ready for immediate use after the war.

## Evolutionary Rather Than Revolutionary

Urgent war needs accelerated and caused many changes and adaptations of pre-war materials. A critical review of procedures and uneconomical practices previously considered sacrosanct resulted in War Production Board directives requiring a greater utilization of the excessive unused strength inherent in most structural materials. For example, directives called for (1) stressing structural steel to a minimum of 24,000 pounds per square inch instead of the 18,000 or 20,000 pounds mandatory in many building codes and used by most engineers; (2) restricting assumed live

loads on roofs to not more than 30 pounds a square foot, with the exception of a few areas subject to heavy snowfalls. The changes that have occurred in building materials, therefore, may be characterized as evolutionary rather than revolutionary.

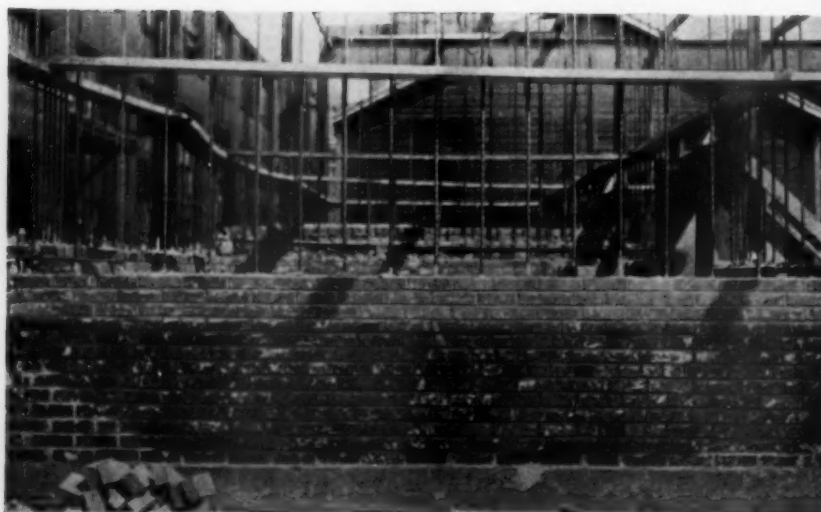
A number of construction items which may be of interest to those in need of post-war school buildings are given below.

## Aluminum Alloys

Structural aluminum alloys will permit the erection of light weight structures from members possessing the advantages inherent in generous dimensions and bulk. Structural aluminum members can be fabricated by well-equipped steel shops, without any major change of method or equipment.

Structural members and materials are available in a variety of aluminum alloys and in different forms adapted to a wide range of use. Alloys for structural purposes vary in strength from 16,000 to 68,000 pounds per square inch and in weight from 165 to 175

Reinforced brick masonry under construction. Reinforced brick masonry may seem like a new idea but actually it has been in force since 1813



pounds per cubic foot, as compared with 55,000 to 60,000 pounds per square inch and a weight of 490 pounds per cubic foot for steel.

Aluminum requires larger shapes and is higher in cost per pound than steel, but this differential is materially offset by the greater volume of aluminum and the lesser cost of transportation and erection.

The usual inertia to building code revisions, and of the engineering profession to unfamiliar materials and properties, always retards the rate of use, and aluminum will be no exception.

Other aluminum products which will receive great acceptance will be windows, trim, moldings and other extruded shapes and aluminum applied to a wood backing.

A process has been developed to prevent aluminum's tarnishing or rubbing off. Instead of metal, acid which releases oxygen is used in the bath, forming aluminum oxide on the surface. The member may be dipped into coloring baths while hot and, under heat, the color is absorbed by the aluminum oxide. Ornamental multi-colored designs may be applied by masking.

#### *Reinforced Brick Masonry*

Reinforced brick masonry has structural possibilities and economies that merit greater recognition and use in building construction. Brickwork usually is considered as suitable for carrying direct compressive stresses only, but reinforced brick masonry (RBM) results in a type of construction capable of carrying heavy loads in flexure and shear, as well as in direct compression.

In RBM, reinforcing bars are introduced into the masonry in the horizontal or vertical mortar joints or in both. Bent up bars and vertical stirrups are easily introduced and effectively resist web stresses.

RBM is not of recent origin. It was used as early as 1813. Its possibilities are demonstrated in the Church of St. Jean de Montmartre, Paris. This church has RBM exterior walls only 4½ inches thick, one portion of which has an unsupported length of 29½ feet for the full height of the wall (115 feet). On the opposite side is a wall of the same thickness, 38 feet 4½ inches high, with an unsupported length of 65 feet. The upper floor of this structure is supported by RBM columns 17⅜ inches square, spaced 39½ feet on centers. An amazing example of the tremendous strength of RBM, the construction defies all accepted standards and practices of modern engineering and would not be permitted by any city building code in this country.

Composite columns consist of a steel column encased in masonry. In computing the size of a steel column encased in brickwork, the majority of the engineering profession ignore the additional strength added to the steel column by the brickwork, on a disproven theory that the stiffer member transmits all of the load.

Tests in 1933 by the National Bureau of Standards showed an ultimate strength of 23,300 pounds per square inch on bare 6-inch H columns, increased to 40,700 pounds per square inch when partly encased in a 14-inch brick wall. Had the columns been fully encased the strength would have been greater. Economy demands that in future buildings proper utilization be made of this knowledge.

Reinforced brick slabs built of a single thickness of brick (2¼ inches) will span up to 6 feet; 3¾-inch slabs up to 10 feet; 6½-inch slabs up to 14 feet. Greater depths permit greater spans.

The increased strength and resistance to lateral stresses of RBM, the elimination of forms other than centering, will bring this type of construction into a prominent place for post-war school construction.

#### *Brick*

An improvement has been made on the salt glazed brick process. A smooth impervious surface free from pin holes, clear glazed, may now be had by an anodizing process.

A new development in brickwork promises to solve the problem of securing leakproof walls without using expensive, wall-weakening, through-wall flashings.

#### *Smooth Ceiling Two-Way Slab Construction*

Flexibility of interior arrangement of partitions is achieved with the use of the smooth ceiling two-way slab construction. This development eliminates the dropped beam previously required for two-way construction yet permits relocation of partitions where desired, without overloading the new supporting area of the floor slab or having to figure extra heavy live loads, as in one-way joist construction.

#### *Wood*

Wood techniques have advanced materially during the war. Chemical science has removed the handicaps of unalterable properties in wood. By impregnating the wood with resin-forming chemicals capable of reacting with wood cellulose, resin is produced within the wood. Sufficiently treated, the wood is dimensionally stable under varying humidity conditions, has greatly increased compressive strength, and far higher strength across the grain. The tensile strength tends to become the same in all directions, an unusual property in wood. The treated wood is hardened, has increased wearing qualities, can be highly polished, and does not show raising of the grain.

#### *Composite Structural Members of Wood*

In the past, large dimension lumber was dependent upon logging trees of adequate size. A 12x12-inch side cut oak timber required a long search to find and a wait of several years to condition for use. Now it may be cut and fabricated from small sections of oak in a week or two.

Glued laminated arches can be made to span any reasonable width with varied forms and degrees of curvature, thus eliminating trusses with bottom chords, tension and compression members, and supporting columns. Large composite beams, boards and the like, as well as arches, are now made from small, readily produced, easily dried sections by gluing.

I-beams and Box-beams made with plywood webs are now easily made for long spans.

#### *Plywood*

The plywood industry has received a great impetus as a result of the war. Research is being carried on to improve the fire-resistant properties of plywood, one of its greatest handicaps.

Metal-surfaced plywoods, now on a specialty basis, will be mass produced after the war.



There is now in mass production a plastic-surfaced plywood made by laminating resin-impregnated paper to surfaces of plywood, to create a hard abrasive-resistant durable surface. Many other types of plastic surfaces can be developed to meet a variety of needs for wall covering, for outside finish, and for industrial uses of many sorts.

A greater proportion of the plywood industry's output after the war will be of the exterior type plywood made with a synthetic waterproof resin binder.

Scarfed panels will be made so that full walls can be produced with no joint problems. Standard 4x8-foot panels are scarfed into panels as wide as 8 feet, and as long as 50 feet, or as long as it is practical to ship them. These panels are scarfed on a ratio of 1 to 6, or 1 to 12, which will develop the full strength of the scarfed joints.

### *Prefabrication*

Prefabrication has been said to be "all things to all men, and a source of confusion to many."

A review of attempts at prefabrication with concrete, with steel, and now with wood, provides an interesting story of technological developments, but a lack of merchandising success.

Two diverse trends now represent the current development, which is applicable principally to house construction: (1) a system of panels, universally applicable; and (2) a factory-made house complete even to the furniture. Obviously both can not have the same future.

After a recent exhaustive study a well-known research foundation concludes that prefabrication is currently in a state of flux; that "it has a long way to go and a great deal to learn, as we have a great deal to learn about it."

### *Timber Connectors*

Timber connectors of six types are now in use. These are: (1) split rings of mild steel, (2) flanged shear plates of pressed steel, (3) toothed rings of sheet steel, (4) claw plates of malleable iron, (5) spike grids of malleable cast iron, and (6) clamping plates.

Timber connectors are used between adjacent faces of overlapping timbers to develop the full working stresses of the lumber by providing a large area for the timber to bear against. Stresses are distributed over practically the entire cross section of the timbers involved, instead of only the small area provided by the usual bolt connection. In addition, timber connectors permit the use of structural quality lumber in smaller sizes; transmit larger loads without seriously reducing the cross section area of the timbers joined; and reduce the amount of hardware—fewer bolts, rods, washers, etc.

### *Two-Thread Screw*

The no-slip screw has threads of two different pitches that pull boards together by an amount equal to the difference between the pitch of the threads. This type of screw properly installed eliminates squeaky and buckling boards.

The screw is so made that the head may be broken off below the flooring and the hole filled with plastic wood.

### *Monel*

Post-war school buildings will incorporate many items of monel because of its toughness, high tensile strength, and great resistance to corrosion.

Among its many uses are: roofing, skylights, flashings, gutters, leaders, expansion joints, anchors for brick, concrete and tile roofing, tie wire, screws, window cleaner bolts, monel gaskets, etc.

### *Plastics*

A bewildering array of widely varied synthetic and natural materials are covered by the word "plastics." These materials may be grouped according to their sources into four main classifications: (1) natural resins, (2) protein substances, (3) cellulose derivatives, (4) synthetic resins. The last two groups are the most useful and the most promising.

Some enthusiasts assert that the proved materials such as wood, glass, and steel and many other materials will immediately be put out of business by these "miracles of science."

No one familiar with the characteristics or production of plastics is in accord with this thought. The manufacturers prefer to think of them as new working tools for industry which will serve best only when carefully selected and used in the right places, supplementing the older more familiar materials.

Plastics are classified according to their reaction to heat as: (1) thermoplastic—heat softening, and (2) thermosetting—heat hardening.

Plastics with a range of over 100 flows can be varied to meet certain specific requirements. Some advantages claimed for plastics include: toughness, durability, lightness compared with aluminum, impact strength, can be easily cleaned, can be easily worked, imperviousness to acids and alkalis, imperviousness to water, can be extruded in rigid and flexible forms, and can be easily laminated. All plastics have some of the above qualities but none have all. Each varies with the particular formula used.

Some plastic materials may be used in educational buildings for such purposes as: insulation, conduits, electric apparatus, pipe lines, fuel lines, gaskets, gauges, shower curtain rods, lighting fixtures, multiple conduit with intake and outflow of hot and cold liquids, spacers, push bars, pulls, screens, shims, splines, channels, wall board, angles, coves, cap sections, stair nosings, stop moulding, shower door frame, display board, terrazzo floor strips, weather stripping, tracks, door sills, glazing and paint brushes.

A new plastic floor tile is now manufactured in a variety of colors. It has the qualities of being flexible, less slippery, greaseproof, and of having high resistance to acids and alkalis, high resistance to indentations, and full recovery after weight is removed. A similar plastic tile with non-slip surface for use on ramps, and so forth, is available.

Wainscotings in tile or sheet form of plastics are also being manufactured.

In selecting plastic materials, extreme care must be exercised to check the physical properties and characteristics of the item for its particular use if satisfactory results are to be obtained.

### *Stainless Steel*

Stainless steel of light gauge with an adhesive back-

ing of asphalt solves the problem of buckling for counter tops and similar flat sheet uses.

#### Fluorescent Lighting

Fluorescent lighting has attained great popularity during the war. The fixtures are available with metal and plastic shields and diffusers, and will rapidly displace incandescent lighting as the price is lowered.

#### Germicidal Radiator

A fertile field for infectious disease exists wherever children or adults assemble. The germicidal radiator, mounted approximately 6½ feet above the floor, utilizes the ultra-violet ray lamp to destroy a major part of the bacteria in the air passing in front of its rays. These fixtures are used by the Army and Navy in barracks for air and floor treatment to destroy bacteria causing athletes foot.

Experimental installations in hospital nurseries and schools have shown beneficial results. These sterilizers should prove a useful tool in reducing the spread of infectious diseases and destroying bacteria on locker and shower room floors.

#### Electronic Heat Lamp

Every school has need for supplementary heat in certain rooms, such as offices, during other than school

hours. A simple economical form for supplying this need is the heat lamp, which can supply varying degrees of heat, according to the type, and may be used in standard receptacles or in special forms. The lamps are manufactured in both portable and fixed types.

Some applications for school use include: heating rest areas in kindergarten and nursery schools; heating sections of a large room using a parabolic reflector; maintaining body temperatures of patients with chills, in the clinic or nurse's room; quick drying of towels in locker rooms, cafeteria, and cooking rooms; as an adjunct of the domestic hot water supply during peak loads; and with a special application of this principle, for sterilization, boiling small quantities of water in less than a minute, cooking, and many other purposes.

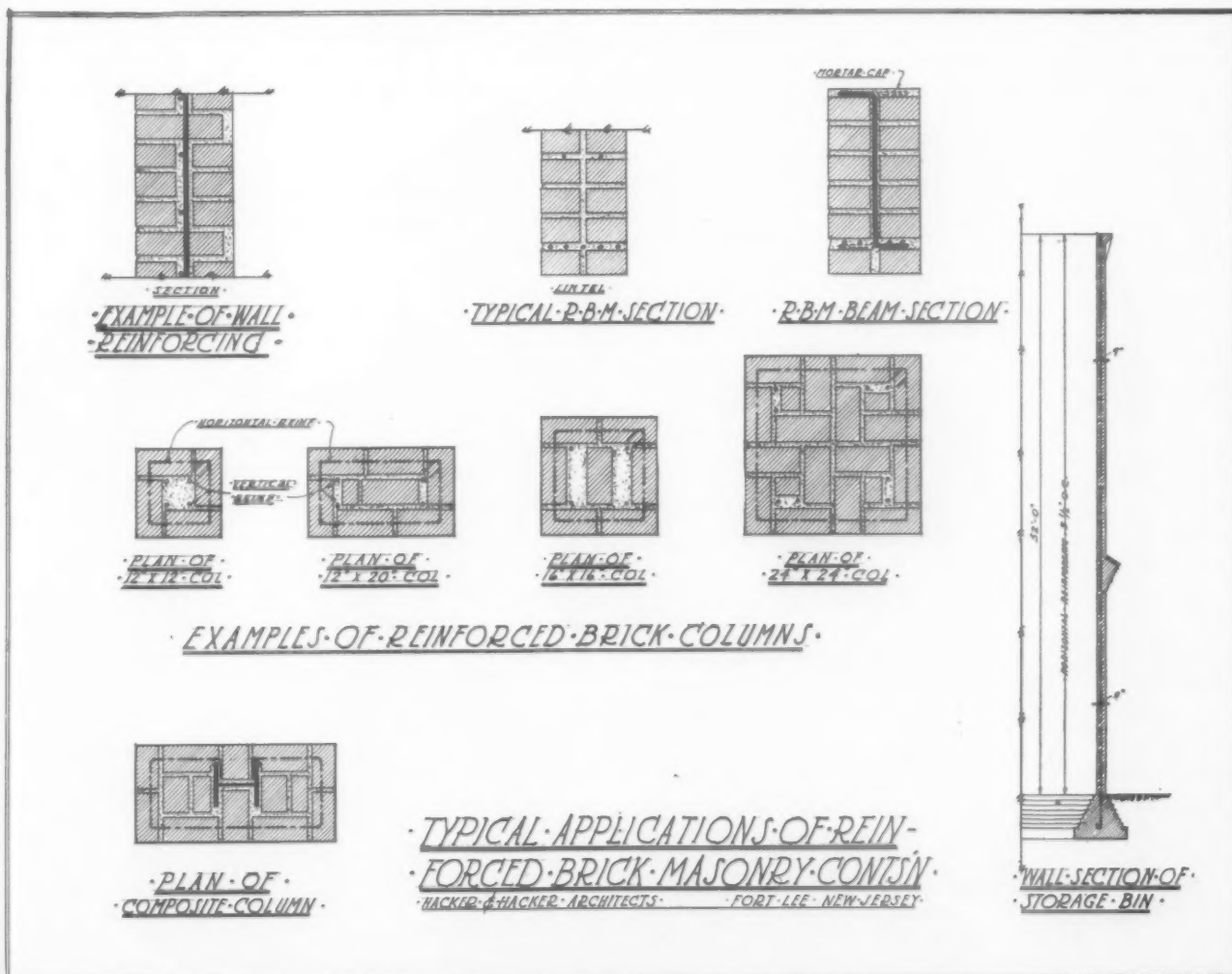
One type of electronic tube may be carried in the hand with no wire attached yet controlled from a switch.

#### Electric Eye

The use of the photo-electric cell for controlling light intensity, opening and closing doors, and for many other purposes may, with a reduction in cost, have a wider use in educational buildings.

#### Piped Light

Certain plastic materials have ability to "pipe" cold



light, without loss of intensity around bends, curves, and twists, from a remote source to the desired location in other stories and rooms.

Eventually this may be developed to an extent that all lamps may be placed at one source easy of access, and eliminate a large portion of the conduit and wiring now installed.

#### *Fiberduct*

Fiberduct is a non-metallic fiber conduit underfloor raceway system suitable for institutional buildings. The fiberducts have negligible water absorption and are made to withstand pressures of 1200 to 1400 pounds. Fittings are of metal.

#### *Non-Fuse Panelboards*

The elimination of fuses in panelboards does away with the problem of spare fuses and maintenance. The use of circuit breakers in mains and branches gives full circuit protection and makes the use of switches and fuses unnecessary.

#### *Radio*

Interference with radio reception will be practically eliminated with the installation of frequency modulation radio sets.

Radio instruction coupled with television will form a new educational medium.

Educational broadcasts of national scope are considered impractical because of the three-hour time differential between New York and San Francisco; the vast extent of the country; and because of different educational organizations and curricula in the 48 states. Delayed broadcasts from local stations are often administratively and financially difficult to achieve. The best solution consists of recordings. The teacher then may familiarize herself with the material before class time and may stop the recording at any point to interpolate explanations or other discussion.

#### *Electron Microscopes*

Electron microscopes which permit magnification to 100,000 diameters have been developed. The instrument is able to see particles from 50 to 100 times smaller than the best light microscope. Electrons are used for illumination instead of visible light and electrical lenses in place of glass lens. Electrons will not travel in air, so it is necessary to evacuate it. As electrons are invisible, the energy in the beam is transformed into light energy to permit viewing the pattern of the specimen.

#### *Light Salvage and Three-Dimensional Seeing*

Greater attention will be given to light salvage in post-war work and to the principles of three-dimensional seeing. This consists of varying colors of low-eye fatigue arranged to highlight danger areas of machines, and so forth.

#### *Panel Heating*

Panel heating has been regarded with slight interest during the last thirty years but is receiving increased study today. Utilizing the principle of radiant heat, its potentialities are many but its application to school buildings must be approached with extreme caution and careful study of all factors involved. The re-

quirement of 30 cubic feet of air per minute per pupil incorporated in many state school codes practically changes a radiant heat design to one of convection.

Tempered glass wall panels with surface heating elements are made in small sizes. These utilize the principle of radiant heating and may be developed into a type satisfactory for the supplementary, if not the primary, heating of schools.

#### *Air Conditioning*

Discussion is being carried on in educational circles as to the need for pupils to complete their college work at an earlier age. This would require increasing the school year from the usual 180 teaching days to possibly 230 or more.

If this is put into effect air conditioning will be a necessary feature in school buildings for the summer months.

Several types of air conditioner units are on the market, designed for house or office use but applicable to some school needs. One all-year air conditioner now on the market consists of a self-contained gas operated unit, designed to provide all the functions for complete year-round air conditioning. It provides heating, humidifying, air cleaning, and circulation in winter, and cooling, dehumidifying, air cleaning and circulation in summer.

#### *Air Recovery*

Many products are on the market for use in air recovery and purification. Indoor air becomes contaminated from many sources and requires replacement by uncontaminated air from the outside, or by purified air recirculated with sufficient outside air added to retain freshness.

Equipment for this purpose includes dry filters, spray filters using water or oil, electric precipitation, activated charcoal, and so forth.

#### *Solar Heating*

Solar heating is arousing widespread interest and presents future possibilities for buildings located in areas with a large preponderance of clear days in cold weather.

Attempts to supplement the heating system with solar heating in schools have resulted in much higher building costs, to a great extent due to spreading out the building to secure the necessary orientation. Some sacrifice of the plan also resulted. The fuel saving is offset by these factors.

#### *Velocitrol*

Volume dampers and splitters are eliminated by the use of a new register called velocitrol. This register is designed to provide adjustable control of air volume, pressure, and distribution across a supply outlet.

#### *Thermal Controls*

Electronics are now being used to coordinate and increase the efficiency of thermal controls. A combination of electronic circuits coupled with pneumatic temperature control equipment, called pneumatronics, is now available.

#### *Motors*

A type of motor has been developed capable of



being instantaneously reversed without lag or loss of power.

#### *Axial Discharge Fans*

Axial discharge fans which receive and discharge air in a continuous straight line simplifys duct connections, require less space, and reduce sheet metal work costs.

#### *Glass Showers*

Prefabricated glass shower enclosures may now be had, constructed of tempered or structural glass, and available in a range of colors.

#### *Metal Bathroom*

One manufacturer's contribution to post-war buildings is a complete bathroom stamped out of metal, including even the tub.

#### **Selection and Installation Require Care**

Post-war school buildings present many opportunities to the skilled school architect. Upon his care in the selection of materials and proper provision for their installation will depend the success of the building.





## SPECIAL FEATURES OF THE SCHOOL PLANT

*Probably the correct view of a school building is as a series of units for housing the various phases of the educational program which will be carried on in it, with the addition of necessary service facilities, all connected by necessary corridors and stairways and arranged in relation to one another so that the utmost of coordination is secured. All these facilities are then placed within four walls with a roof over it, and the entire structure designed to meet the unique conditions of a specific site and in harmony with its community environment. Each unit in the structure must be designed therefore for the particular use to which it is to be put. It is necessary then that school administrators and architects give special attention to each unit which is to be incorporated in a given building. This section of the AMERICAN SCHOOL AND UNIVERSITY provides much helpful material on various facilities which require special planning.*



# REALISTIC PLANNING OF SCHOOL AUDITORIUMS

By CHARLES BURSCH

Chief, Division of Schoolhouse Planning, State Department of Education, Sacramento, Calif.

**A** DISCUSSION of functional planning of school auditoriums may well be undertaken from a number of points of view. Ordinarily the approach is to determine as closely as possible an ideal functioning arrangement and then to proceed to provide the facilities indicated. If all the facilities can not be financed during one building program, the usual procedure is to construct as much of the ideal unit as can be purchased at the time and leave its completion for future building programs.

There is much to commend this procedure in that ultimately it is possible that the best known solution will be forthcoming. However, it is practical only when justifiable assumptions can be made of both financial ability and willingness to complete the ideal unit. If these assumptions are not fully justified, the school district will limp along indefinitely without some of the facilities essential to modern enriched educational and recreational programs.

The experience of school planning officials indicates that there are many more school districts unable financially, than able, to provide ideal facilities for the numerous school activities which require, for their successful performance, rooms substantially larger and more specialized than ordinary classrooms. To this large group of financially limited districts must be added others, which are fundamentally unwilling, though able, to invest more than a limited amount of money for housing services other than those provided in classrooms.

With these facts and conditions in mind, a realistic approach to the planning of school auditoriums, in most school districts, is to develop the type of acceptable room that gives the largest number of extra-classroom educational and recreational services for the least expenditure of funds.

## Is Multi-Use Room Satisfactory?

The multi-use room then, including auditorium services, is the most functional type of building for most school districts. More of the necessary and desirable functions are thus served within the financial means of the district than can ever be served by spending all of the district's actual or potential resources on one highly specialized auditorium, playroom, gymnasium, cafeteria, or social hall. Certainly a practical type of functional planning is more concerned with the maximum service return for the building dollars a school district can afford, or is willing, to spend, than it is with the development of "ideal" plans for units that can never be financed.

It is readily admitted that an auditorium planned so that it will serve also as a playroom, a gymnasium, a cafeteria, or a social hall will not be as good for strictly auditorium purposes as a building planned

exclusively for an auditorium. It is contended here, however, that a thorough satisfactory and acceptable school auditorium can be planned as part of a multi-use school and community building, provided that as much energy and ability is devoted to making it workable as has generally been devoted to proving it impractical.

## Causes of Disappointments

The practicality and acceptability of multi-use buildings is beyond the theory stage. Many such units have been in successful operation for several years and are acclaimed by school and community alike as the most valuable portion of the school plant. There are also in use many combination buildings that are quite disappointing and unsatisfactory. These disappointments stem largely from two sources, (1) poor planning, and (2) poor administration.

The results of poor planning are observed in many forms. One of the most common is to plan the unit so that the interior as well as the exterior looks like a typical auditorium except that a flat floor is provided instead of a sloping one. Such a unit is impractical as a playroom because of its wall and window treatment. Neither is it as successful when used as an auditorium, as would be the case with a sloping floor. The interior treatment must be appropriate for use for all of the activities to be housed. This may call for drastic changes from traditional appearances. Acoustical conditioning, to mention a single example, will require different treatment in a multi-use room than that given a separate auditorium. Until such changes in appearance as are required for proper functioning on a multi-use basis are considered acceptable, there can be no logical basis for a multi-use room.

Poor location on the building site is a planning weakness that often restricts the usefulness of a multi-use room. Accessibility under cover from the classroom portion of the school, noise isolation from the classrooms, and a convenient entrance from the street are essential features of a good location. A location that permits the service separation of the multi-use room from the rest of the school building makes its use after school hours, and by adults, practical and economical. Provision of opportunities for the future addition of appropriate auxiliary rooms and services enhances the value of a location for a multi-use room, in that it permits a school and community to grow into the many potential uses of such a building. The functional life of the original investment is prolonged when use-enrichment and modernization can be effected by appropriate building additions.

Sometimes it appears that planners of auditorium-playrooms conclude that since a playroom does not

# SCHOOL FACILITIES for COMMUNITY USE

ADAPTED FROM  
THOSE PLANNED  
AT THE CARMICHAEL  
ELEMENTARY SCHOOL

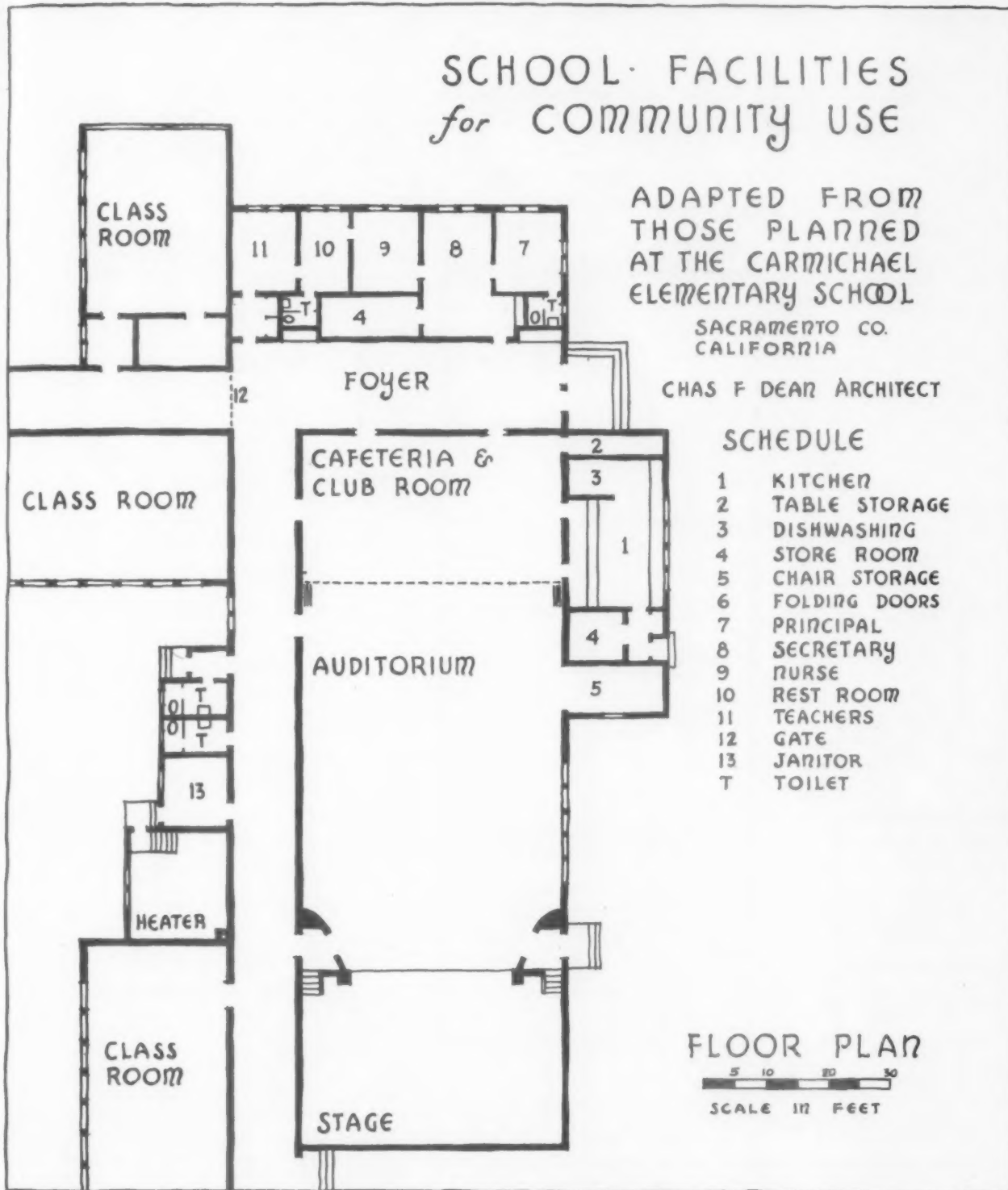
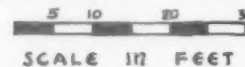
SACRAMENTO CO.  
CALIFORNIA

CHAS F DEAN ARCHITECT

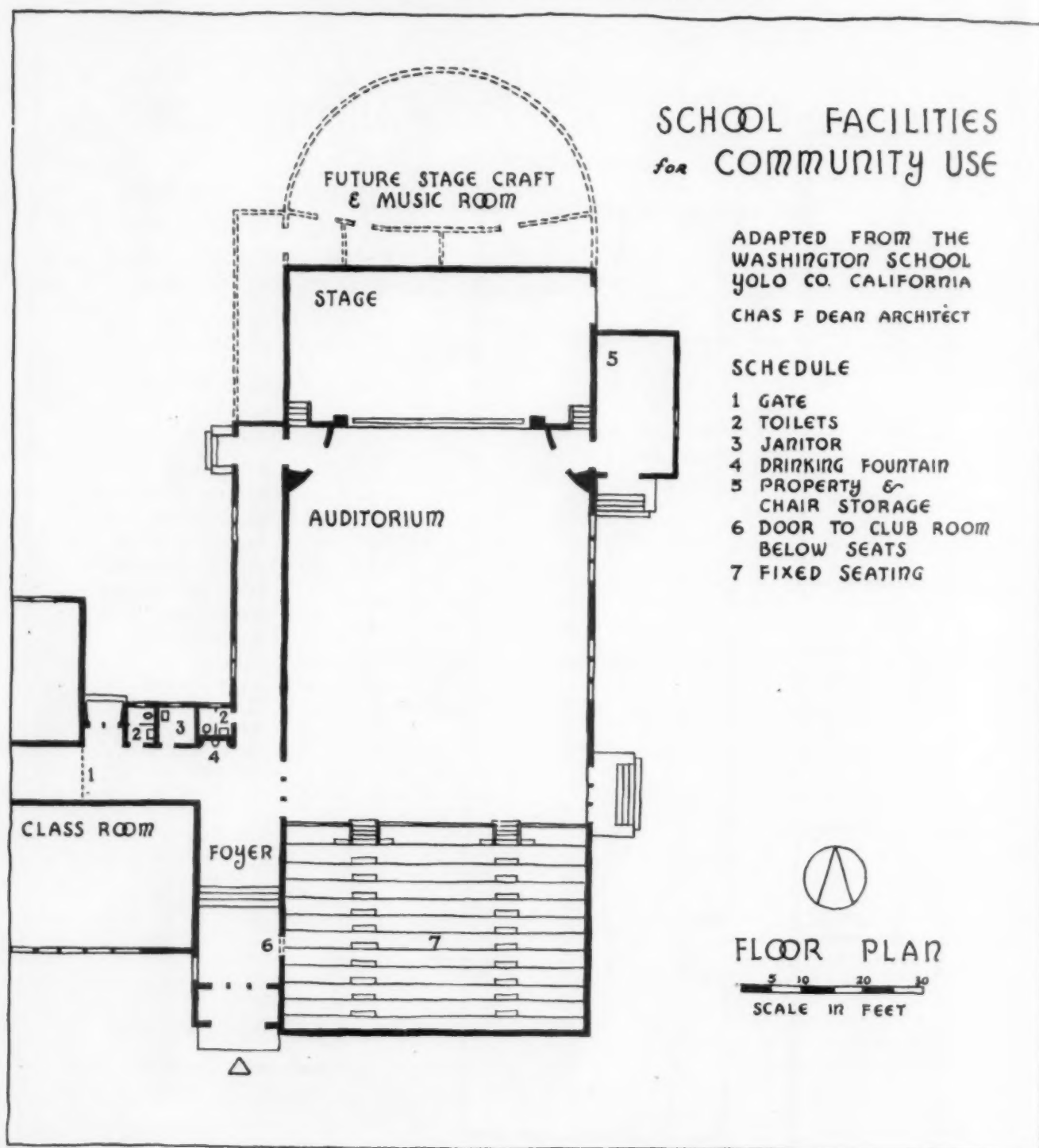
## SCHEDULE

- 1 KITCHEN
- 2 TABLE STORAGE
- 3 DISHWASHING
- 4 STORE ROOM
- 5 CHAIR STORAGE
- 6 FOLDING DOORS
- 7 PRINCIPAL
- 8 SECRETARY
- 9 NURSE
- 10 REST ROOM
- 11 TEACHERS
- 12 GATE
- 13 JANITOR
- T TOILET

## FLOOR PLAN



What are the factors that make a multi-use room workable? This diagram, and the diagrams following, illustrate two multi-use rooms that incorporate some of the features discussed: service separation of the multi-use room, a well-designed stage, and provision for storage of property and chairs. The stage should have acting space of sufficient width and depth, ample wing space, available dressing rooms, and effective lighting

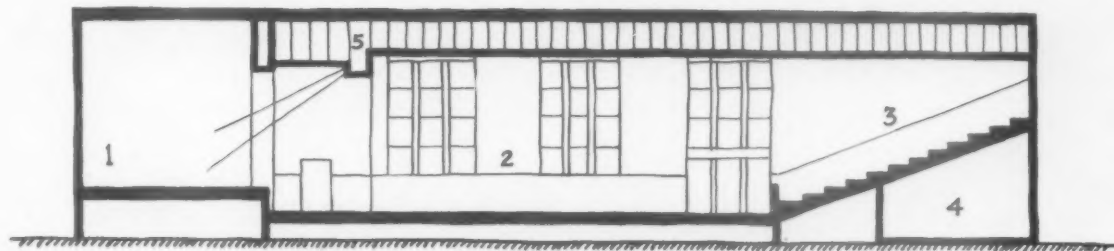


make what they consider a good-looking auditorium, a small simple platform is an appropriate substitute for an adequate stage. The stage is the key to the educational service to be rendered by an auditorium and must be ample in size and well-designed. There is no reason for the stage in a combined unit to be less well-planned and equipped than it would be if it were a part of a separate auditorium. Unless ample wing space, available dressing rooms, effective lighting installations, property and scenery storage are provided as adjuncts to acting space of sufficient width

and depth, the educational return for funds expended will not be realized.

Another planning fault is failure to provide suitable furniture and equipment. Proper selection of chairs, folding or wall-hung tables, and easily removable equipment for play, is imperative for successful operation of multi-use rooms. Real improvements in furniture and equipment, especially designed for multi-use rooms, may be expected in the post-war period, especially if it is more generally recognized that such rooms are the only available solution for





### SECTION THRU AUDITORIUM

ADAPTED FROM THE  
WASHINGTON SCHOOL  
YOLO CO. CALIFORNIA

CHAS F DEAR ARCHITECT

### SCHEDULE

- 1 STAGE
- 2 AUDITORIUM
- 3 FIXED SEATING
- 4 CLUB ROOM
- 5 SPOT LIGHT GALLERY

5 10 20 30  
SCALE IN FEET

needed auditorium and physical education housing in most school districts.

Still another evidence of poor planning is the inadequacy or awkwardness of provisions for storage of folding chairs and tables, and of other furniture and equipment items required. Many multi-use rooms have failed at this point. If, for example, the room is to be used for instrumental music and adequate and safe storage is not provided for instruments, a situation prevails which makes other uses of the room difficult. Such difficulties tend strongly to limit the range of usefulness of a room that is intended for multi-use. No combination unit can hope to be successful until suitable solutions are found for its special storage problems.

The difficulties encountered in the administration of multi-use rooms arise from many causes. However, most of them may be attributed to poor planning, as discussed above, lack of real appreciation of the educational and recreational value to be realized from the use of such a building, and natural inertia or laziness on the part of those whose work it is to make necessary changes in furniture and equipment. The successful functioning of a multi-use room may not be expected unless adequate and competent custodial personnel is available to take care of the furniture shifts necessary to secure the range of uses intended in the planning and construction of the multi-use room.

#### Aids to Planning

The emphasis upon the multi-use room or combination auditorium-gymnasium, as it is frequently designated, is made because of the need to bring this type of unit into acceptable membership in the family of useful school buildings and remove it from the status

of "step-child." Furthermore, I know of no part of the school plant that has as large and useful a volume of literature concerning its functional planning as has the separate school auditorium. I refer to the numerous splendid articles on that subject in past editions of *THE AMERICAN SCHOOL AND UNIVERSITY*.<sup>1</sup> Other valuable discussions include the bulletin by Alice Barrows and Lee Simonson,<sup>2</sup> issued in 1939 from the United States Office of Education, the comprehensive auditorium check list appearing in *A Method of Procedure and Checking Schedule in Planning School Buildings* by John J. Donovan in 1932,<sup>3</sup> and in the second chapter of *Planning the Community School* by Engelhardt and Engelhardt, 1940.<sup>4</sup>

Those responsible for the planning of a multi-use room must, of course, draw upon all available planning data for the auditorium and stage, as well as for a gymnasium, playroom, music room, or any other service that is to be given in the combined unit. There is considerable evidence that some of the planning failures in multi-use rooms grow out of the belief that such a unit is not worthy of careful and intelligent planning.

Highly specialized consulting service is essential in planning the arrangement and lighting of any stage and in the acoustical treatment of any room that is to serve as an auditorium. Failure to use such specialized service spells almost certain doom to good educational service from the building when constructed.

<sup>1</sup> Editor's note: See "Auditoriums," Cumulative Index to Editorial Subjects, on page 5 of this issue.

<sup>2</sup> Alice Barrows and Lee Simonson, *The School Auditorium as a Theater* (U. S. Office of Education Bulletin 1939, No. 4. U. S. Government Printing Office).

<sup>3</sup> John J. Donovan, *A Method of Procedure and Checking Schedule in Planning School Buildings* (New York: Bruce Publishing Co., 1932).

<sup>4</sup> N. L. Engelhardt and N. L. Engelhardt, Jr., *Planning the Community School* (New York: American Book Co., 1940).

# THE POST-WAR SCHOOL SHOP

By L. W. FOX

Director, Vocational Education, San Antonio Public Schools, San Antonio, Texas

WHEN peace comes, we will be confronted with the complex and difficult problem of adjusting our national life from a wartime to a peacetime economy. The number one responsibility confronting us in this adjustment period will be to keep our people at work without loss of time. People must have work to keep them busy earning a living. If we can do this effectively and quickly all will be well. When the whistles blow and the bells ring announcing the end of the war what will be the nature of the economic situation into which our people will have to be fitted and what will be the peculiar nature of our people who must be fitted to this new peacetime world? Let us examine for a bit this so-called new economic world which we hear so much about these days.

## The Men and the Machines

As soon as peace is declared, our war industries will be shut down immediately. Every factory in the United States engaged in war work will immediately discharge its war workers or at least the large majority of them and begin converting its plant for peacetime production. Henry Kaiser of the Pacific Coast has said that unless definite plans are made for meeting the impact of peacetime conditions on his industries, he will not be able to keep more than five per cent of his present employees at work when his war contracts are ended. This is no doubt true of all other large war plants. In a similar manner the centers for training our war forces will be tremendously reduced and their training personnel and trainees will likewise be added to the millions of war industries workers who must be readjusted to a peacetime economy. Our armed forces also will reduce their personnel, which again will swell the numbers that must be adjusted to the changed situation. And so on for the multiplied hundreds of government agencies engaged in war work directly or indirectly. It has been estimated that some thirty millions of our people will have to be readjusted to peacetime work when the war ends. The exact number, however, is not important. But what is extremely important is that we do something about it now!

These millions of people who are now engaged in fighting the war and manufacturing the materials of war will have to be trained and retrained for peacetime pursuits in a "new world." We are told in every issue of our magazines and newspapers, in pamphlets and books, and over the radio about the new things that await us when the peace comes. We are told that we have made greater technological advancement in the last three years than we would normally have made in the next fifty years—due to the impact of the war on our technological research laboratories engaged in the search for new and better ways and things with which to overcome our enemies.

We are told of new designs for houses that "breathe," which are heated by vacuum tubes hidden in the walls, with windows through which you can look out but not in, equipped with a three-dimensional television radio, all made of pre-fabricated plastics and other new constructional materials and which can be erected in a few hours; furniture of new design made of plastics and light metals, kitchen stoves made of ceramics with automatic heat controls, refrigerators with compartments whose temperature may be varied to suit our purposes; farms completely electrified; farm labor done with labor-saving, automatic farm machinery; vegetables grown in chemically-treated fluids; foods quick-frozen immediately after picking and delivered across the nation in fast-flying cargo-carrying airplanes; clothing made of glass, plastics, and other synthetic materials; crash-proof automobiles that will cruise at 100 miles per hour on great super-highways; business men by the thousands flying to work in their own helicopters; passenger trains that will be a veritable hotel on wheels, speeding across the country at 100 miles per hour; ships built of welded aluminum or other light metals equipped with electronic devices to prevent collisions and driven by electricity; improved artificial lighting more nearly approximating daylight in color and diffusion—and so on and on in every phase of human endeavor!

There will be no aspect of industry or area of our lives that will not be modified in some way by these new inventions of our war-born technology. These new and improved things with which we will be surrounded, as well as customary things, must first be manufactured, then installed, and finally kept in good running order. They will require large numbers of workers trained in new technologies with new skills the majority of which our workers do not now possess. The tremendous job of training and retraining these millions of workers will be the responsibility of the public schools and colleges of the nation, and if the public schools and colleges do not recognize and meet these new training responsibilities, new governmental agencies like the National Youth Administration will be set up to do the job.

## New Type of Adult Education

Adult education will play a more prominent part in our future educational system than it has in the past. These millions of our workers who must be trained and retrained will definitely be adults and, obviously, our system of free public schools will have to take a new view of and a new attitude toward adult education. Our school plants will have to take these new objectives into account in the post-war programs of free public education. We will not only have to do this as a social necessity but we must recognize adult educa-

tion as an integral part of our public school system. True, we have had, for a long time, a smattering of adult education when times were good and money plentiful but a real, thoughtful, comprehensive system of free public adult education we have not had except in perhaps isolated instances. The post-war situation will demand that we give this phase of public education our serious, thoughtful attention. And what will be the nature of this post-war program of adult education? What will be the peculiar educational needs of these adults to be trained and retrained for the post-war economy?

First, there will be the great mass of displaced war-workers who will have to be trained and retrained for whatever work is available in the post-war world. The processes of wartime work and peacetime work are not the same. The work or job demands will be different, all of which will require that our dislocated and displaced war workers be afforded opportunities for re-education in new, peacetime industrial and technical processes.

Our demobilized fighting forces will also have to be given the opportunity for training and retraining for the post-war peacetime world. Many fighting men entered the armed forces without work experience or without vocational training for a job—at the age of eighteen. To them must be given the opportunity to prepare for a job. Other millions of our fighting forces will find their old jobs obsolete or non-existent on

their return. These also must be given the opportunity to prepare or retrain themselves for post-war peacetime jobs. Still other thousands will have been disabled and unable to function at their pre-war jobs. They therefore must be rehabilitated and trained for post-war work. Bills are now pending in Congress to take care of this veterans' training program. Not only will the expenses of the education of these veterans be taken care of at government expense but also subsistence for the veterans and his dependents will be provided for. It is estimated that there will be some six million of such veterans to be trained, retrained, or educated and that the expense will be about a billion dollars. It is figured that this will be a part of the costs of the war.

#### Vocational Training for the 66 Per Cent

One thing this war has proven conclusively and that is that we had failed in adequately training workers for our technical and mechanical needs. The vast programs of, first, National Defense Training, and later, War Industries Training, prove this. Every phase and kind of industry incidental to the war effort had to establish a personnel training program. This should not happen again!

In our post-war educational program of free public schools, opportunities must be afforded in order that every boy and girl desiring technical, mechanical, or occupational training may get it. Studies show that





about 17 per cent of our present high school population go to college, another 17 per cent prepare for the skilled trades. The remaining 66 per cent get no training for anything in particular. Why should they be neglected? Their potential productivity is a national asset that we can ill afford to waste! What this 66 per cent of neglected high school students will probably do in life should be carefully determined and an educational program designed to fit them.

It is admitted that the nature of the training program that should be offered this 66 per cent is more or less conjectural—their needs are so indeterminate and diversified. It seems that they should be given a wide variety of basic hand, machine, and technical skills. They will not become our skilled craftsmen but will perform many machine operations, and do work of a various nature not requiring extensive skill, and will, in all probability, make frequent shifts from job to job. They should be given the type of training that will adapt them to a modern, machine world and make them capable of quick adaptation to new job demands of limited technical knowledge and skill requirements. Also, they should be given a basic understanding of our industrial economy, how to get along with other people, and the elements of good citizenship.

#### The Post-War Shop

The post-war high school, trade and technical school, and municipal junior college will no doubt be

called upon to do a large part of this pending post-war readjustment training, retraining, and education. Science laboratories and technical and industrial workshops in these institutions will have to be revamped and expanded to meet the post-war training demands that will be made of them. An attempt follows to describe the facilities that the industrial shops in these institutions should have. Of course, it is not felt that these are the only, or even the best, solutions of post-war shop planning and organization. They are simply one solution. Some desirable shop features have been sacrificed or lessened in efficiency in order to increase that of other features—in shop planning like in other things—"you can't have everything."

The number of student work stations will vary with the idea of the planners and what the "traffic will bear." The writer has visited shops where 40 work stations per teacher were provided, while in some government training shops 10 work stations per teacher were provided which later were reduced to 6. It seems that in junior high schools 24 to 36 student-stations per shop, or teacher, is the most common practice; in senior high schools about 24; while in trade and vocational schools, 16 to 24 seems to be about the common practice. In all the shops shown a "home" work station is provided for each student. Each such home work station is equipped with a set of hand tools that will be in most frequent use by the student stationed there.





Special tools with which to meet special needs from time to time are kept in the tool room, while special machines and "unit" facilities are provided "on the floor" to meet the special needs in doing the work being taught in that particular shop, and on the floor a unit of the special equipment required to teach any skill or field of work desired may be placed. The student will use this special equipment as needed.

In the future, more attention must be given to the technical knowledge involved in shop practices. To this end a theory and planning room has been shown to accompany each shop. "Notebook work" by the student here finds full play, and, of course, the usual tool room, stock room, wash and locker room, and instructor's office is provided. As an incentive and an inspiration to students—and for the principal to show visitors—an exhibit room for students' work should be provided if possible. Convenient arrangement of all these features is a matter for the planners to decide to satisfy their feelings about the relative importance of these several details.

#### In General

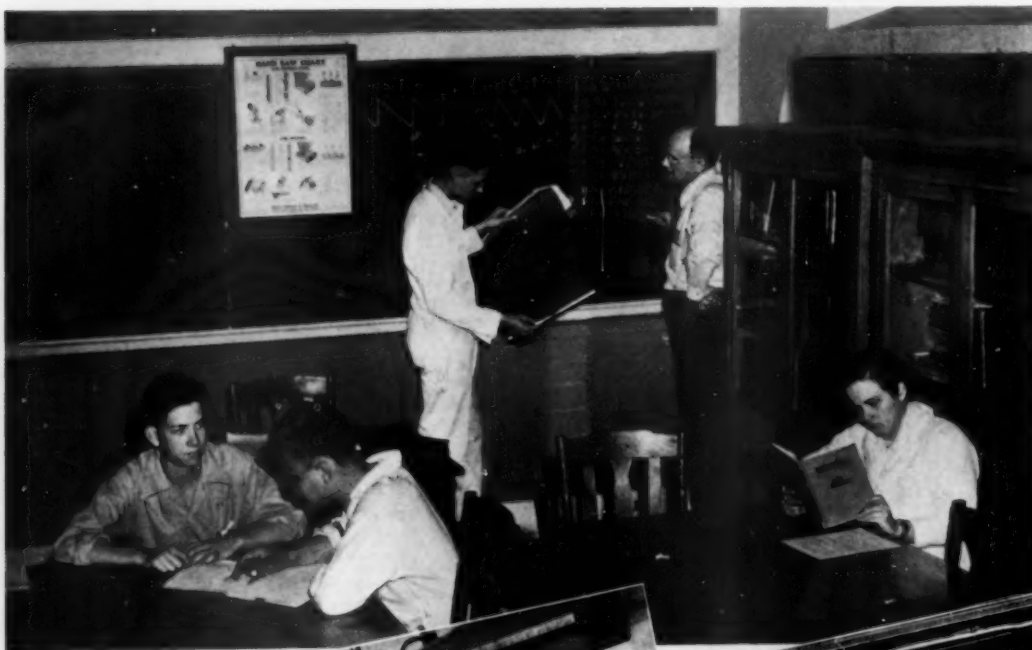
The floor plans presented herewith show one Vocational Day-Trade Machine Shop, one each of a Senior High School General Metal and Woodworking Shops, and one each of a Junior High School General Metal and Woodworking Shop.

These shop layouts express the ideas of a number of

shop teachers who have had some years of teaching experience. They are intended only as suggestions from which school shop planners may develop their own plans. No attempt has been made to show electrical outlets, gas outlets, compressed air, water, nor exhaust lines, as these depend entirely on the location of equipment and need.

Adequate drinking fountains should be conveniently provided. This is seldom done in school planning. Edge grain flooring or wood block are considered excellent shop floors. School shops should be made ample in size to take care of the required number of pupils. School administrators sometime fail to provide ample space for the required student load per teacher and then complain that the industrial departments do not care for enough students per teacher.

Shops should have from 12 to 15-foot candles of light at work-level height, for general lighting, both natural or artificial, with additional adjustable lights over lathes or other machines and work stations where precision work must be performed. Entire walls may be built of glass brick to allow light to come in but prevent students looking out. Ceilings and walls above the wainscot should be painted white to reflect light and brighten the shop. Fluorescent lights are especially good when remodeling shops. They may be installed to give more light from existing outlets without increasing the load on the wiring. A fixture using four 40-watt fluorescent tubes will draw 160 watts and



Left—Theory and planning room of a day trade woodworking shop. The instructor is discussing a project with a student. The two students together are studying a set of plans. The girl student is at work on an assignment

Below—in the spray booth of a finishing room students are spraying a drawing desk made in the school woodworking shop



Above—Pouring molten metal and tempering tools in a heat-treating, foundry, and blacksmith shop

Right—Exhibit of students' work in a "display room."







Corner of a neatly arranged woodworking tool room. The tags are receipts for tools taken out by students. The tool room attendant checks all tools returned for damages.

give about the same light as a 500-watt incandescent light bulb.

#### *The Theory and Planning Room*

The theory and planning room has many purposes. It serves as a general assembly room for the class. Tables are provided instead of tablet arm-chairs for planning new work, drafting, sketching, and study. It contains a shop library, a magazine rack, and project display shelves. A double-glass partition is shown which gives additional light and excludes shop noises and dust. When only a part of the class is working inside, it enables the instructor to observe all students. This room should be provided with dark shades for the showing of moving pictures and the other visual aids. Visual aids are going to increase in use as aids in shop instruction.

#### *The Display Room*

Projects on display are always an interest-creating factor both for students and for visitors. In this room students' projects, cutaways, working models, and similar materials are displayed. When space is not available for an exclusive display room, students' projects may be displayed on panels, shelves, and glass-top tables in the theory and planning room.

#### *The Instructor's Office*

The instructor should have a small noise-proof office where he can plan his work, keep records, and give counsel to his students whenever floor space will permit. Plans are shown with and without such instructor's offices.

#### *The Finishing Room*

If a finishing room is necessary it should be dust-proof and well lighted. The spray booth is provided with an 18" exhaust fan as a health protection. The

paint cabinet is metal-lined to eliminate fire hazards, benches are metal-covered. Fireproof containers for oily rags must be provided.

#### *The Heat-Treating Room*

The metal shops show a heat treatment, gas and arc welding, blacksmithing, and foundry department. The experiences gained in this department are essential for anyone contemplating entering any of the metal trades. This department should have the floor covered with sixteen or eighteen-gauge black iron.

#### *The Tool Room*

Proper care of tools is of great importance. A tool room is provided in which the tools that are frequently used should be "shadow-painted" and neatly arranged on panels for easy replacing and checking. Each and every tool should have a fixed and definite place for its reception when not in use.

#### *The Store Room*

A store room is needed and is usually arranged with adequate bins, racks, and shelving for all surplus stock on hand—usually a semester's supply.

#### *The Wash and Locker Room*

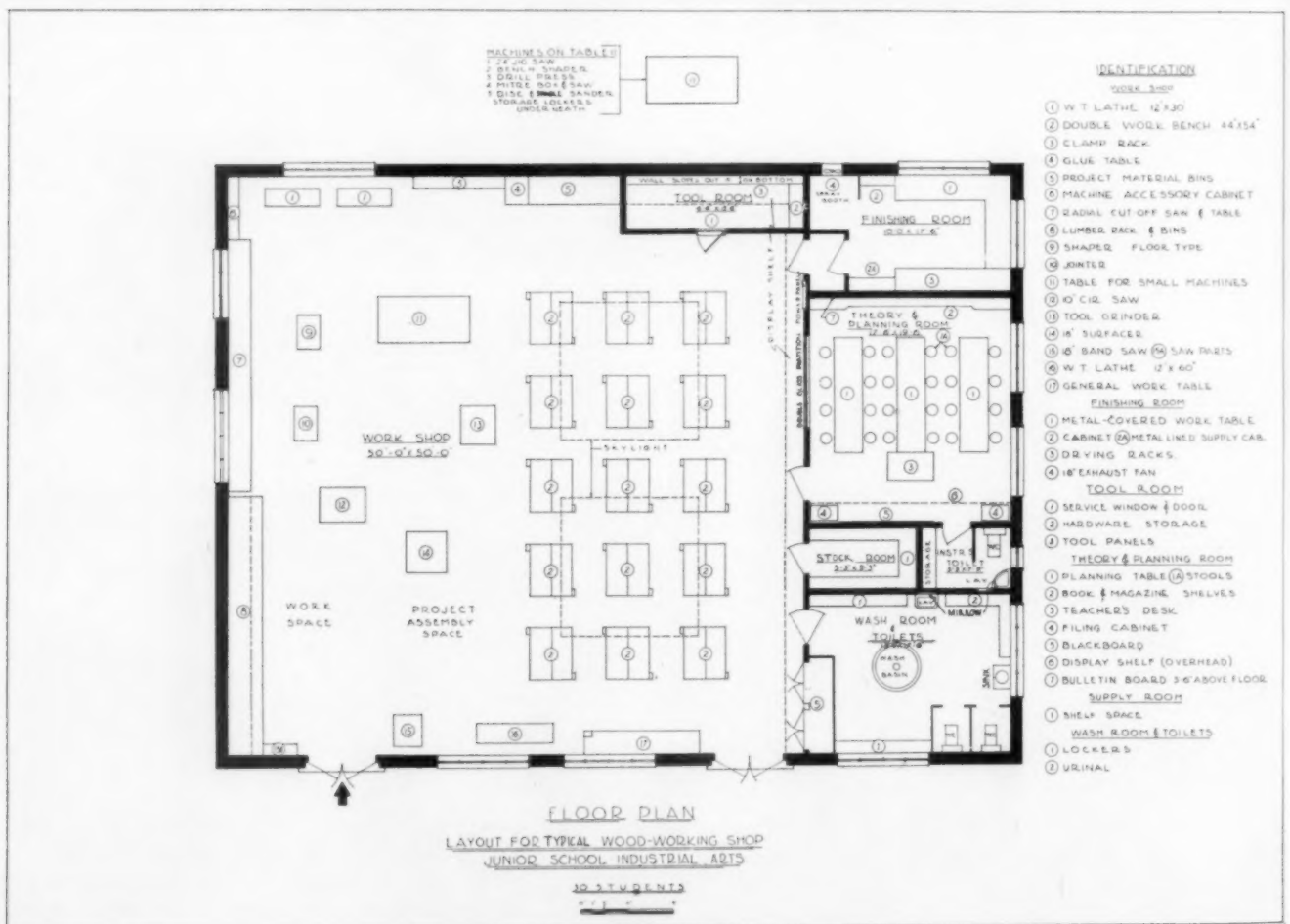
The wash room is shown on a mezzanine floor in three of the plans which is one way of meeting a situation where floor space is at a premium. Wash rooms should provide adequate wash basin space, toilets, urinals, individual student lockers, mirrors, adequate ventilation, etc.

#### *The Work Shop*

A work place is provided in all of the plans for every student, which may be called his "home station" from which he goes to operate any equipment necessary to complete his project or job. The drawers in



View of a day trade vocational machine shop. The students are working on various types of projects and are operating different makes of lathes. A few of the home work stations are shown





the work benches should contain the common bench tools used daily to save time and prevent a jam at the tool room window at the beginning and end of class periods. By designing the "home station" work bench as an "all purpose" work bench and by making the units on the shop floor flexible the shop may be kept abreast of the industrial training needs of the community.

#### Sound-Proofing and Dust Exhausts

Sound-proofing all walls and ceilings should be considered to keep down the noise in the shops as well as to prevent disturbing the balance of the school. This will result in more and better student work, less nerve strain, and the rest of the school will feel more friendly to the department when it does not disturb academic classes. Acoustical tile with a sound reduction coefficient of 60 per cent or more should be used on the ceilings to be effective. Shop walls or partitions adjacent to halls and classrooms should be sound-proofed by lining them with acoustical material.

Special exhaust systems should be installed on individual machines and equipment to carry off the sawdust, shavings, fumes, gases, emery dust, and particles

of metal to safeguard the health of the students and instructors. We owe it to the health of our youth and instructors to eliminate this dust, etc., from the air they breathe.

Machines should be of various makes to acquaint the student with various kinds, types, and sizes. The equipment is conveniently spotted to facilitate movement. The shops are free from interior obstructions. This enables the instructor to observe all areas of the shop at all times.

#### Survey of the Community

Shops in a school should be adequate to give basic training in the industries and fields of employment in the community. Before planning such shops a thorough and comprehensive survey of the industrial life of the community that the school serves should be made and such shops established and equipment provided that the survey reveals are needed. When a shop is to be used for evening classes for adults also, care should be taken to provide adequate facilities such as lockers for the adult group as well as for the regular day school classes. The shop plans shown in this article are intended only as typical.



# FACILITIES FOR A COMPREHENSIVE PROGRAM OF CONSUMER EDUCATION

By JAMES E. MENDENHALL

Office of Price Administration, Washington, D. C., (formerly Educational Director, Institute for Consumer Education)

THE war program has placed an increasing responsibility upon American schools to provide consumer education to the children, youth, and adults of their communities. Today, when our people face critical shortages of many civilian goods and imminent dangers of skyrocketing prices, for example, all citizens need to acquire the skills, knowledge, attitudes, and practices which make up competent and patriotic consumer behavior.

Toward this over-all goal, which also has important peacetime implications, consumer education has four major objectives. It aims to help the consumer become:

1. A better *manager* of his resources of money and goods;
2. A wiser *buyer* of goods and services;
3. A more effective *user* of what he has;
4. A better-informed and wiser-acting *consumer-citizen*.

## Each Teacher Can Contribute

If a school is to achieve these objectives, it must develop a comprehensive program of consumer education.<sup>1</sup> This requires the participation of many if not all teachers, and at the high school level, of teachers who are specialists in different aspects of consumption. It also demands the provision of adequate plant facilities.

No matter at what grade level instruction is carried on or what subject is taught, every teacher can contribute to a school's consumer education program. From Grade I through Grade XII, to illustrate, pupils can learn to handle their allowances or earnings more intelligently and to take better care of consumer goods—clothing, household equipment, and school supplies. The home economics teacher can aid pupils to buy food according to nutritional standards, rationing rules, and community price ceilings. The business education teacher can help them to master the techniques of personal and family budgeting, and to understand the wartime limitations placed upon sellers as well as buyers of consumer goods. The social studies teacher can assist them to comprehend the nation's program to hold prices steady during the war period. The teachers of science, mathematics, English, fine arts, industrial arts, and other subjects can also promote more satisfactory consumer behavior.<sup>2</sup>

Not only can each teacher on his own contribute to the program, but all teachers within a school can come together, perhaps in a Consumer Education

Council, to plan and coordinate their activities in this important area of experience. In doing so, they will develop a school program in which education for consumption is given an emphasis equivalent to that now given to education for production.

## Plant Facilities—Minimum Essentials

With reference to efficient use of plant facilities for a consumer education program, a school for the duration will have to get along, more rather than less, with what it has. War requirements have placed severe restrictions upon the building of new school plants and upon their equipment. Nevertheless, the average school has some equipment already at hand with which to advance its consumer education activities. It should, of course, take stock of present facilities and take full advantage of them.

Again, what these material resources are and how they are used will be determined by the consumer education program which a school decides to carry on. Typically, consumer education is offered as one or more units of study or as a special emphasis in such courses as home economics, business education, and social studies. In a growing number of schools, it is also offered as a separate course to pupils in Grades XI and XII.

Whether the program is undertaken cooperatively or not within a school, each teacher can organize his own consumer education projects and other activities and can provide the necessary classroom facilities. A teacher of social studies, general business, or English, for example, can see that the classroom has the following minimum essentials:<sup>3</sup>

1. Shelves for textbooks and other reference materials, for storage of large charts, posters, consumer goods, and empty containers with labels attached;
2. A filing cabinet for pamphlets, clippings, student papers, and the like;
3. A large table for committee meetings, consumer exhibits and demonstrations, preparation of charts, and display of reference materials;
4. A bulletin board for mounting newspaper and magazine clippings, advertisements, charts, posters, and pupil-prepared materials;
5. A file box for reference cards dealing with books, articles, and other sources of consumer information;
6. Simple art materials for making posters, charts, graphs, etc.

A teacher of home economics or science, of fine arts or industrial arts, can of course make good use of ex-

<sup>1</sup> For a comprehensive program, see the syllabus for *The Consumer Problems Course*, Stephens College, Columbus, Missouri.

<sup>2</sup> For a suggested high school program, see *Some Principles of Consumer Education at the Secondary School Level*, U. S. Office of Education, Pamphlet No. 94, 1940. Superintendent of Documents, Washington, D. C. 16 cents.

<sup>3</sup> For a more nearly complete account of suggested facilities and materials, see Chapter XV, "Consumer Education—A Laboratory Approach"; Chapter XIV, "Sources of Information," and Chapter XX, "Bibliography on Consumer Education," in *Consumer Education*, James E. Mendenhall and Henry Harap (Editors), D. Appleton-Century Company, New York, 1943.

isting facilities for consumer education. In the home economics kitchen, sewing room, and practice "house," pupils can learn to make simple consumer tests of food products; to develop techniques for care, repair, and make-over of clothing; and to use correctly modern household equipment and products. In the science laboratory, they can make simple analyses of such commodities as cosmetics and cleansers, and can compound simple products such as toothpaste, face cream, and floor preparations. (This, by the way, gives pupils a greater understanding of commercial processes and products.) In fine arts, they can make timely posters and other visual materials. In industrial arts, they can learn to repair household appliances and equipment; to recondition furniture; to install weatherstripping; and to care for the family automobile—skills which are particularly vital in wartime and have peacetime carry-over values.

Although all pupils do not take all consumer-oriented subjects such as home economics, a school can arrange its schedule so that more classes have access to laboratory facilities. To illustrate, a social studies class which is studying a unit on "best buys" in products often purchased by pupils (soft drinks, candy, cosmetics, clothing, etc.) can hold sessions in

A school program in consumer education can thus, with present facilities, be fully adapted to the immediate consumer needs and wants of children and youth. It can aid pupils to deal more intelligently with their day-to-day problems of managing personal resources, buying goods and services, and using the goods they have so as to obtain maximum utility. It can relate these personal problems to the broader problems of the national economy including price stabilization, rationing, salvage, war bonds, taxation, income distribution, social security, housing, medical care, transportation, recreation, self- and government-regulation of business, and the means and costs of production and distribution.

#### Extra-Class and Community Activities

Extra-class activities can also have a real place in consumer education program of a school. The operation of the school cafeteria offers opportunity for pupils to get practical experience not only in food selection and spending of meal allowances but also in food purchasing and preparation, and in handling money and accounts. The planning of club functions (parties, picnics, buying class rings and pins, raising money for gifts) and of the concomitant expenditures



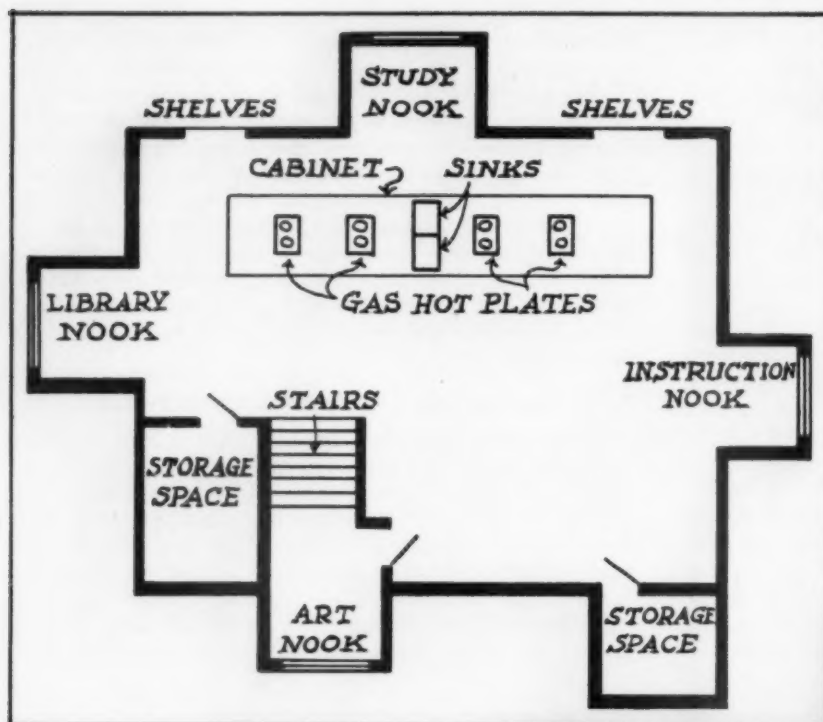
Students at Stephens College, Columbia, Mo., have access to an extensive collection of books, pamphlets, and periodicals in the field of consumer economics and consumer education

the home economics laboratory where the required equipment is available.

To serve particular classes or the school as a whole, the library can emphasize consumer education, perhaps through a consumer corner. The library can feature a display of consumer books, pamphlets, clippings, and pupil-prepared materials on food buying and nutrition, on thrift and war bonds, on conservation of consumer goods, on price control and rationing, and on the fight against inflation. Such displays require such common equipment as a bulletin board and a table.

can become consumer activities. The purchasing of textbooks, school supplies, and athletic clothing and equipment can serve as projects of real value to young consumers.

Such a consumer education program, furthermore, can be extended to serve adults in the community. What pupils learn in school about wartime economic problems, for example, is often discussed at home with parents. What teachers and administrators do through parents' associations, through the organizations to which they belong, and through public forums and adult education classes, all contribute to lifting



The consumer education laboratory at  
Stephens College

Students learn to make simple consumer tests, using materials and equipment found in the average household or easily obtainable in local stores



the level of consumer literacy within the community as a whole.

#### Post-War Facilities

School people are looking ahead to the post-war days when resources will be available for building new schools, for remodeling old ones, and for furnishing schools of both types with the equipment and materials required for conducting an optimal program of consumer education. If they are convinced of the importance of consumer education in the total school program, teachers and administrators will proceed with plans to develop adequate facilities for consumer training and to coordinate these facilities.

A school which desires to set up an all-out program may find it desirable to establish a consumer education laboratory. This laboratory, set up in a reasonably large room, may include the following: <sup>4</sup>

<sup>4</sup> The laboratory herewith described was developed by the Institute for Consumer Education, formerly located at Stephens College, Columbus, Missouri.

1. At the front of the room is a long experiment table with work space sufficient to accommodate an average-sized class. The table is covered with dark linoleum, with overhead fluorescent lighting. For each two pupils working opposite there is a sink, hot and cold running water, and a gas hot plate. For every pupil there is a built-in drawer for cutlery, measuring spoons and cups, a thermometer, etc., and a cabinet for pots, pans, and other kitchen utensils. This experiment table is used by pupils to make simple consumer tests and compounds; also by the teacher in performing consumer demonstrations. All equipment, it should be noted, is that found in an ordinary kitchen so that pupils learn to conduct experiments in a practical rather than in an ideal situation.

2. A storage closet contains a kitchen scale, food mixer, and other more valuable equipment; samples of various brands of soap, face powder, foods, clothing materials, and the like for comparative testing; and other supplies.



Stephens College students go marketing. Here, in a butcher store, they are able to tell the clerk just what cut of meat they would like to have



3. At the rear of the room is a drawing table with simple drafting instruments and art materials for the preparation of charts, graphs, posters, and other illustrations dealing with experimental findings and with other projects developed by pupils.

4. Around the room are filing cabinets, tables for display of publications, a bulletin board, and shelves for necessary purposes.

5. Most room space is given to ordinary tables and chairs for the use of pupils. These tables, of course, can be arranged for class discussions, committee meetings, and classroom playlets.

6. Available is an inexpensive portable radio-phonograph-recorder combination. This machine is used for listening to and analyzing commercial broadcasts and for hearing educational programs, for playing records of interest to consumers, and for recording short pupil-prepared consumer dramas.

7. Available also is a portable sound projector for showing government, commercial, and independent

films of consumer concern. A still projector is employed to display slide films obtained elsewhere or prepared by pupils.

#### Experiences Outside of Special Laboratory

Whether or not a school has its own consumer education laboratory, it can plan to set up home economics and science laboratories, and fine arts, industrial arts, and other workshops which definitely provide many and varied consumer experiences to all pupils. It can assure that its library is modern, featuring consumer exhibits and displays of interest to young people. It can provide the books, pamphlets, posters, and other materials which deal with consumer problems of current and widespread concern. Through such facilities, a school can meet in full its obligation to educate pupils not only for college entrance and for productive occupations but also for competent consumer living as individuals, family members, and citizens in our American democracy.



These Stephens College girls examine the quality and cost of the vegetables with a critical and knowing eye. Their aim is to make the "best buy" for their needs

# THE POST-WAR SCHOOL LUNCHROOM

By HELEN E. McCLEERY

Director, Home Economics and Lunchrooms, Des Moines Public Schools, Des Moines, Iowa

WHEN school cafeterias first opened in America they were strictly utilitarian. They served good food at low cost and considered the job well done. Later, managers realized that the appearance of the counter could influence food selection; they displayed food in the most attractive way possible and found that attractive, colorful foods served on interesting dishes sold better than plain food on plain dishes. Today, educators recognize that the cafeteria can be of great educational value to the pupils. In planning the school cafeteria we should consider the educational as well as the physical aspects.

## Physical Aspects

### Location

The cafeteria should be located on the ground or first floor. There should be wide corridors on at least two sides of it. Rooms located around it should house classes of a nature that will not be disturbed by the lunch period noise. Space for the dining room, kitchen, serving unit, and adequate storage should be allowed.



Courtesy of the Rochester (N. Y.) Board of Education

Salads on colored glass plates have pupil appeal

Every cafeteria has its own particular needs and requirements and each one is different. Plans should be carefully made to provide adequate working and storage space, conveniently located centers, facilities for easy deliveries, and well-arranged physical properties so that time, effort, and motion may be expended wisely in doing the necessary work of food preparation. Principals, teachers, and cafeteria managers should be given a voice in planning the cafeteria. In no case should it be left entirely to the architect, although he is of invaluable help and can offer expert advice.

### Lavatories

Experience has shown us that unless it is easy and convenient to wash, most boys and girls will eat with dirty hands. Lavatories located off the corridors approaching the lunchroom, or handwashing equipment installed in the corridor approaches to the lunchroom, are needed to encourage clean hands and promote good health habits.

### Book Racks

Experience too has taught us that books and notebooks are always a problem in the lunchroom. Unless space is provided for them they fill up the tables, give an unsightly appearance to the room and detract from the atmosphere of friendly hospitality we desire. Books can be stored in racks provided along the corridor approaching the lunchroom or racks may be built in the chairs just below the seat. These can be high enough not to interfere with sweeping and still provide excellent storage space for books and notebooks.

### Drinking Fountains

Health authorities agree that everyone should drink plenty of water each day. Refrigerated drinking fountains should be conveniently located in several places in the room. The number necessary will depend on the size of the room. Storage space for glasses should be near the fountains and enough glasses provided so every child can take a glass of water to his table. Glasses and fountains are more to be desired than bubblers.

### Service Counter

The service counter is in a sense a part of both dining room and the kitchen. The counter should be of a height to suit the age of the children using it. A stainless steel or monel metal counter is most lasting and attractive. If it can be double it speeds service considerably. The counter should be equipped with panel adapters to take various size containers. It should

be arranged so that trays can be returned to dish-washing center without crossing the serving lines. There should be no cross traffic between those leaving serving lines and those entering to be served.

#### *Dining Room, Furnishings and Equipment*

We want our lunchroom dining room to be cheerful, interesting, and beautiful. The walls and ceiling must be sound-proofed. A noisy room makes for confusion and does not aid table conversation. The floors should be of a noise-reducing material that is durable, attractive, and easily cleaned. Linoleum, rubber tile, and asphalt tile are the most satisfactory materials known today. New ones may be on the market after the war. Tables and chairs should be well-constructed, attractive, light in weight and color, and durable. Probably a post-war type of metal furniture would be most satisfactory, since there could be no complaints then about rough edges causing hosiery snags. Chairs are much more comfortable than stools and should be used if at all possible.

The walls should be light in color and decorated with good pictures, and interesting hangings. Artistic arrangements of branches, flowers, and plants will add much to the room. Pupils from art and homemaking classes can make arrangements according to the season of the year that will add interest to the room.

Draperies will give a note of charm to the windows and the room. Experience has shown that in a large room color rather than pattern is most effective. Plain colors in interesting weaves or horizontal or vertical striped materials can be used most effectively as draperies. If they are made full enough to pull across the window to keep out sunlight, no shades will be needed. If not, shades or venetian blinds should be provided.

Using colorful china and glassware is an easy way to add a pleasing note to the food service and to the dining room. Food looks better on cream colored dishes than on pure white. Salads are more attractive on colored glass plates and colored drinking glasses cost little more than clear ones, yet make food more inviting. Children and workers have been found to be more careful of attractive dishes and glassware, thus reducing breakage costs. Bean pots, casseroles, and custard cups are available in many colors today. These also add a note in interest and make the food and the room more pleasing.

All china and glassware should be durable. A vitrified medium hotel weight is usually the best buy in china. Rolled edges chip less easily but add to bulkiness. A good quality lime glass that is free from imperfections and in hotel weight is satisfactory for drinking glasses. Stem sherberts in colored glass add to the gaiety of the counter and make fruit and puddings served in them more attractive to the children. Trays should be of a material that reduces noise and should be large enough to hold a meal.

The room should be large enough to provide tables of various sizes. Tables for four, and six and eight provide for easy conversation groups and make committee group meetings possible. Much of the committee group planning in adult life is done by small groups working and planning together around the lunch table. Schools can be excellent laboratories for teaching the techniques of such meetings. If small



*Courtesy of the Hotel Monthly*

Simple, colorful furnishings lend the Willard Hall dining room, Northwestern University, a pleasing appearance

rooms off the main room are practical, two or three such rooms seating about fifty each give pupils excellent practice rooms to work this way in larger school committee groups and provide attractive small rooms for school and community parties.

The room should seat at least one-fourth of the pupils at a time, and 30 to 45 minutes should be allowed for eating. This amount of time is most important if our lunchroom is to teach good table manners. It may be necessary to have three or even four lunch periods in a large school, but when a child is assigned a period for lunch he should be assured a comfortable seat and adequate time to enjoy his food.

We know that it pays high dividends in morale, good health, and parents' appreciation to serve good food at low cost, but we can also use our school dining room as a laboratory to teach the social graces, to give practice in working with others around luncheon committee meetings, and in learning to express the feeling of hospitality which is important to every school.

#### *Kitchen Arrangement and Equipment*

Planning the kitchen arrangement and equipment is a problem needing careful thought and the help of the lunchroom manager working with the advice of a good kitchen engineer. The kind and amount of material selected will depend on the size of the school, whether or not all children remain at school for lunch, and the amount of money available.

The kitchen should have as much labor-saving electrical equipment as possible. A heavy-duty range, a



steam-jacketed stock kettle set in a 2½ inch floor depression, a compartment steamer, bakery tables, a thermostatically controlled insulated oven, an electric mixer, an electric dishwashing machine with tables for soiled and clean dishes, portable tables, portable racks small enough to be moved back and forth easily, and an electric refrigerator are essential. The size and number of the pieces of equipment will depend on the size of the school and the number of children served. *The School Cafeteria* by Mary De Garmo Bryan contains a chapter on selecting and arranging equipment which will be very valuable for anyone planning and equipping a kitchen.\*

Sinks should be constructed with rounded corners and pitched to drain easily. Whether the sinks, tables, steamer, counter, and other pieces of equipment are made of monel metal or stainless steel will depend on the money available for the building. A galvanized iron sink costs 25 to 35 dollars, while one of stainless metal costs 200 dollars or more. The iron sink will last about four years and the stainless metal thirty years or more. If one considers good looks and the cost of labor in repair, surely the stainless metal is the best buy. Such factors should be given consideration in selecting each piece of equipment.

#### Educational Aspects

School cafeterias must serve good, wholesome, well-prepared, attractive food at low cost. But that is not going far enough; children must be helped to make their selection. This help is the responsibility of the whole school. Eating for good health must become a part of the teaching of every class. It is important to teach the children a pattern of meal selection that sets a high standard but not too high for the average child to attain.

This educational program will need to be fitted to the child's age level. In the elementary and junior high schools the cafeteria manager, homemaking

teacher, school nurse, and principal can act as a committee to initiate the program and advise the teachers.

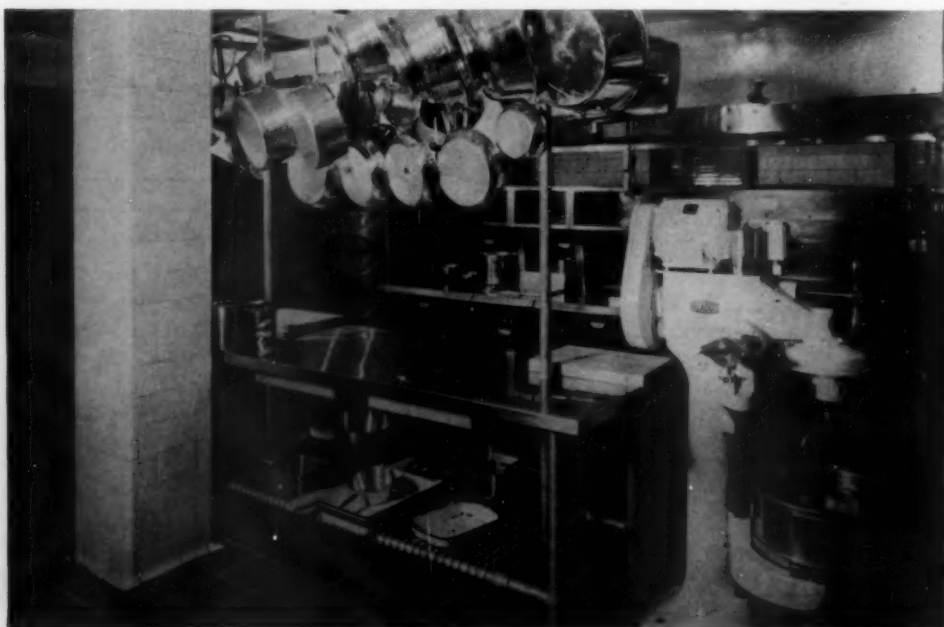
The day's lunchroom menu can be studied each morning in the home room or first-hour class, and the children can select well-balanced lunches at various prices. Some children bring part of their lunch and need help in selecting the best food to supplement what they have brought from home. Posting menus in the hall bulletin boards at least one day before they are served will help mothers in planning what to send if they pack part of the lunch, and in deciding what to prepare for the evening meal.

Lunchroom managers and workers can give advice to children as they make their food selection. Actual displays of good lunches can be arranged with food or food models. Posters and pictures can be used to interest and educate the child. Serving a "plate lunch special" which contains a hot main dish, a fruit or vegetable, and milk is an easy way to help the child make a good selection in a short time. Where plate lunches have been tried they have usually been successful and have greatly increased the sale of milk. Some schools have used effectively a plan for scoring lunches. Among younger children this seems to work very well.

Home rooms guided by a committee can do much to help boys and girls develop the social graces using the lunchroom as the laboratory. Discussions about courtesy in the line, in the dining room, in selecting food from the counter, attitude toward women who work in the cafeteria, each person's responsibility for guests, how to eat certain foods as soup, for example, can be discussed in small groups.

A trip through the lunchroom kitchens helps the pupils to understand the problems of the lunchroom manager and makes getting one's lunch at school more interesting. If children see the large kettle of soup in the making, the ovens being used for the main dish, the cakes being frosted, as well as the pans of vegetables ready for the steamer, and the materials ready for salads, they get a new interest in their lunchroom.

\* Mary De Garmo Bryan, *The School Cafeteria* (New York: F. S. Crofts & Co., 1936).



The kitchen of the Willard Hall dining room, the result of the combined thinking of architect, kitchen engineer, and dining hall manager, is an example of efficient planning. Small but well-ordered and completely electric, the kitchen serves 1200 meals a day



A milk bar adjoins the nursery school of the Crow Island School, Winnetka, Ill.

The storerooms with their rows and rows of canned foods never cease to amaze the child. A clever manager can do much to sell her cafeteria and the value of making a healthful lunch selection by using such a trip to stimulate the child's interest. Parents too will enjoy such a trip and are more cooperative when they see *good* food carefully prepared in a spotless kitchen.

There is no reason why the lunchroom needs to be closed every afternoon. An attractive school lunchroom can become a community center. It can be used for banquets, dinners, forums, and organizational meetings. Parents who happen to be in the building about lunch time should be invited to remain for the noon meal. This increases their understanding of the lunchroom and increases the pupils' feeling of responsibility for hospitality.

Some boards of education still feel that the cafeteria should be entirely self-supporting, because in their

opinion it has no educational value. However, with thoughtful planning in providing adequate time for lunch, enough space, a beautifully furnished lunchroom, and an adequate educational program, the school cafeteria can readily become the laboratory where good health, food, and social habits are effectively learned. Could any learning be more important?

#### Do Your Planning Now

The pre-war years of depression and these war years have given us some guideposts for planning the school cafeteria to be constructed when victory comes. Although science is making advances even today, and post-war building will bring us exciting new features and materials which we will consider and evaluate when we are ready to build, we can now make the large plans on the basis of our experience.



## OFFICE PRACTICE ROOMS



By **THOMAS J. HIGGINS**

Assistant Director, Building Survey, Board of Education

Chicago, Ill.

**F**IVE years ago the Jones Commercial High School was established in Chicago's loop. Its immediate success and acceptance by the tradesmen and office employers were gratifying. There has never been a time that the number of graduates has met their demands. Both night and summer sessions are now being provided in addition to the regular day program.

The success of the Jones school created a demand for vocational-commercial training in the outlying high schools. Facilities were therefore provided for a concentrated course in clerical duties in five schools, one in each of the five high school districts. In these schools an office practice room was established by removing the partition between two classrooms.

### Room Layout and Activity

The room layout follows that found in a well planned business office. Each section contains the desks necessary for doing the work planned for it. The instructional materials include integrated problems built around "orders" coming into the "office." Students in working on the order routines and related tasks gain experience very similar to that received on the actual job. As one example of how this is accomplished, the desks in one section (Order-Credit-Billing-Posting) and the activities which take place at each during the course of an integrated problem follow:

*Desk or Desks*  
Order-Credit

*Student Activity at Each*  
Receives customer's order. Checks credit standing of customer. Routes order to stock control desk.

Stock control desk	Checks to see if each item on incoming order is in stock. If not in stock, makes proper notation. Checks price of each item on incoming order (if in stock) to see that it agrees with that on stock record. Deducts quantity of each item ordered, thus keeping stock records up to date.
Calculating	Checks extensions and totals on incoming order.
Billing	Bills customers.
Calculating	Checks extensions and totals on customer's invoice to see if they are correct and agree with figures on incoming order.
Posting	Posts customer's "accounts receivable" ledger.

Each student spends a period of time in each department.

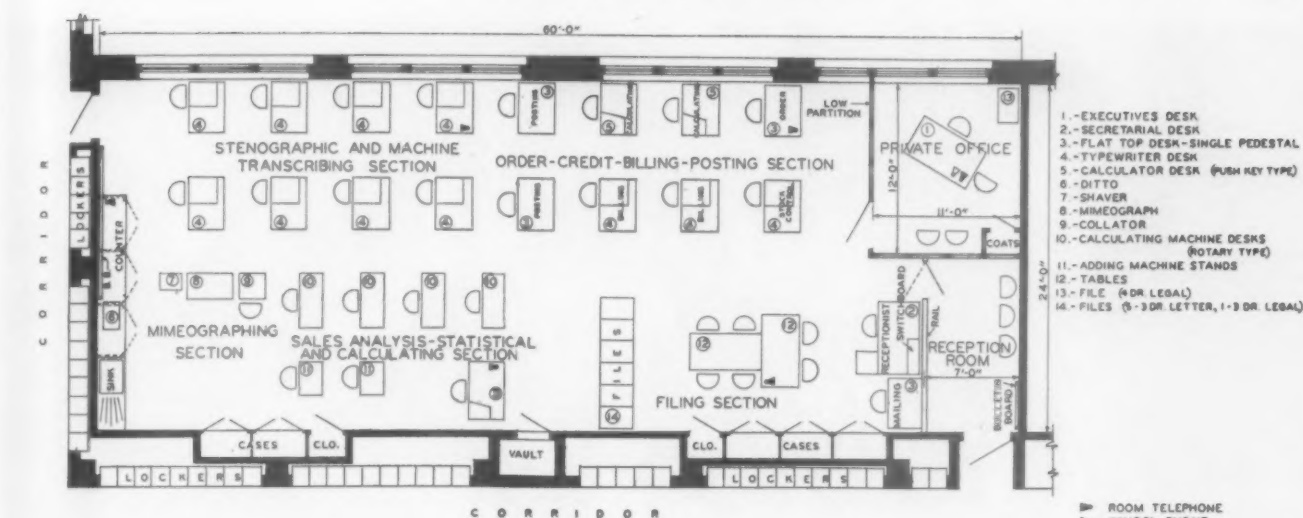
The rooms are 24 feet wide and 60 feet long. Rooms of this size provide space for the equipment necessary to carry on the functions commonly found in a business office, and yet are not too large to be supervised by one teacher.

The ceilings are sound-proofed and the floors are covered with linoleum, effectively preventing distraction from noise. The private office gives the teacher an opportunity to hold conferences with students. Both the sound reducing feature and the private office are of much importance in a room where so many activities are going on at one time.

### Situation Is Realistic

The course of study and the plan of the office practice room are not a preconceived idea of educators





PLAN - OFFICE PRACTICE ROOM

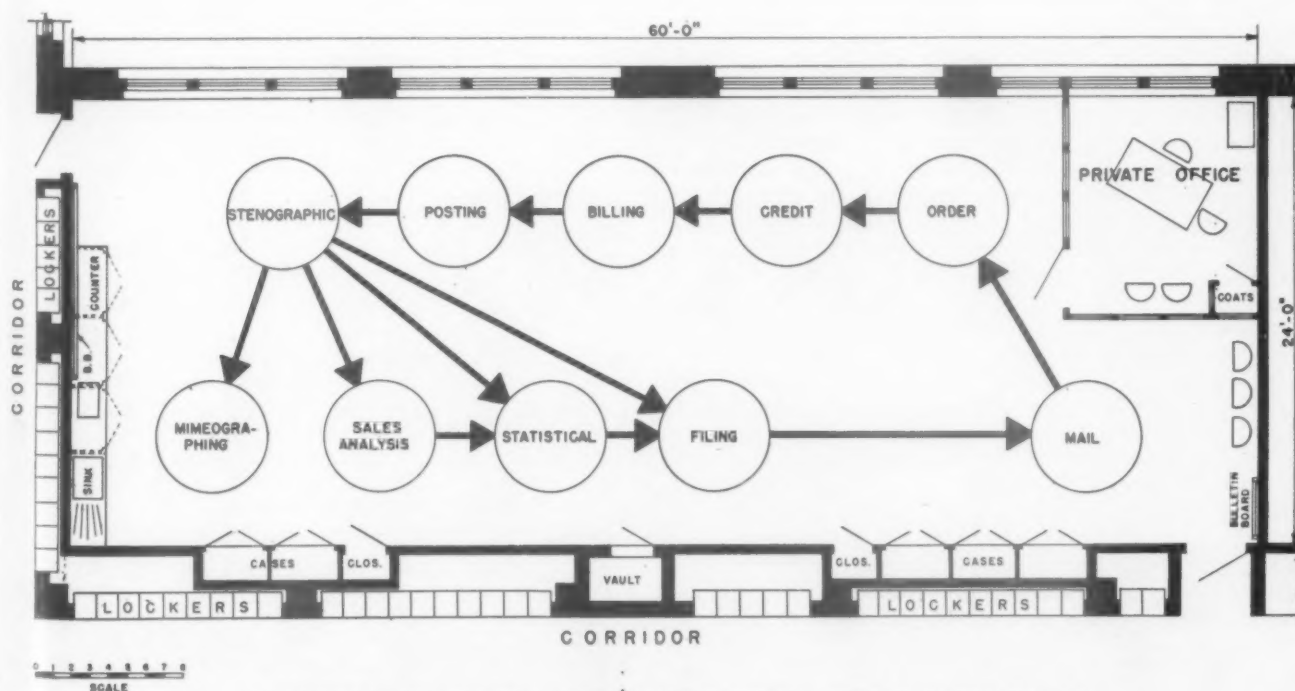
CHICAGO - BOARD OF EDUCATION  
SEPTEMBER 1942

alone. The Office Managers Association of Chicago gave unstintingly of its time in working out details and procedures. The offices of numerous firms were studied and the executives of these concerns gave valuable suggestions as to office practices.

The course is not intended to supplant other commercial training in the high schools. The fundamental principles of stenography, typing, and bookkeeping are still taught in the customary manner. Only senior

commercial students, with at least two years' of training, are eligible for clerical practice.

Students in the office practice course, not only receive machine experience, but see the application of it in a situation similar to that found in the real office. Also they learn to work together cooperatively in a business-like environment, which makes it much easier for them to adjust themselves to their initial positions.



PROGRESS OF ORDERS THROUGH A GENERAL OFFICE ORGANIZATION

CHICAGO BOARD OF EDUCATION  
NOVEMBER 1943



## LESSONS FROM THE WAR REGARDING FACILITIES FOR PHYSICAL EDUCATION

By DAVID K. BRACE

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**T**O attempt to draw deductions as to lessons which the war has so far taught us about the needs for changes in facilities and equipment for physical education is about like trying to predict the outcome of a football game at the end of the first quarter. However, we believe that our team will win and win or lose we expect to get ready to play a better game if and when called upon to do so.

The process of taking stock as the war progresses, of learning what lessons we can from the present situation, and of beginning to plan for the future seems sound procedure. It is sound procedure, however, only if we keep in mind that the war is not yet over and that final conclusions cannot be drawn until we know more about the ways in which our educational programs will be affected.

With this point of view as a background, I will try to set forth the lessons which I believe we can learn from the war, at this stage, which have a bearing on facilities for physical education. I will follow the procedure of stating the lesson to be learned, as I see it, and then giving an opinion as to its effect on needs for facilities for physical education.

### Examination Rooms—Rest Rooms

*Lesson 1. Remediable health defects are a major cause of rejections for military service, and are a handicap in all other walks of life.*—Health defects of boys and girls must be discovered and corrected at an early age. At each level and continuously school

health and physical education programs must encourage the discovery and correction of remediable health defects.

Facilities for health examinations will be needed in each high school and college or university as well as in elementary schools. In small elementary schools, a room which also can be used as a rest room for teachers or students, first aid room, and conference room is desirable. Such a room should be equipped with a couch, chairs, cabinets, running hot and cold water (if possible), first-aid supplies, and equipment used in health examinations other than that supplied by the physician. Examination rooms may be located near the gymnasium offices and dressing rooms.

Adequate files should be provided in offices, so that records of examinations and of physical development and achievement can be kept for ready reference.

### Corrective Rooms

*Lesson 2. Many boys and girls need special individual corrective and developmental exercise programs.*—Special exercise programs should be planned to meet needs revealed by the health examination and should be carried on by professionally trained personnel working under medical supervision.

Facilities for remedial and corrective programs include a special corrective room in a gymnasium. Such a room often has private dressing and bathing facilities and such equipment as mats, balance beams, chest weights, quarter circles, foot exercise barrels,

wall parallel bars, horizontal bars, stall bars and benches, mirrors, plinths, over-head ladders, flying rings, wands and indian clubs, and electric record players.

High school gymnasiums and in some cases college gymnasiums frequently lack needed space and equipment for individual corrective programs. The necessity of furnishing exercise and physical therapy for returned war-wounded young men who continue their schooling will very probably increase the need for such facilities.

#### More Fields, Courts, and Sports Buildings

*Lesson 3. The physical fitness of the bulk of our young men and women is inadequate.*—Our military forces have recognized the poor physical development of a large percentage of inductees and have been forced to devote an early part of training periods to the development of physical fitness. Similar conditions have been revealed in the case of women entering the armed forces and industry.

It is apparent that schools must provide more time for physical education. A daily period for all students in elementary and high schools is now accepted as the desirable goal. Our colleges have also increased the time allotted to physical education and in very many cases have extended the requirement from two years to four years.

Our programs of the future must also be planned to reach 100 per cent of our boys and girls and not only the 10 per cent of superior students who make school and college athletic teams.

Adequate facilities should be provided for girls as well as for boys. In many schools the facilities are barely adequate for the boys and their athletic teams.

As regards facilities, the extension of physical fitness programs to all students and for each school day will necessitate a tremendous increase in gymnasium and athletic field space. I believe that it is easily safe to say that our school facilities must be more than doubled.

In high schools of 400 pupils or more, separate gymnasium floors and athletic fields are needed for boys and girls. Schools which are large enough to require two or more classes at a given period should be equipped with separate floor spaces arranged so that the noise and movement of one class will not disturb the other. The practice of having two classes on a single floor divided by a net is entirely inadequate.

In planning new facilities for physical education, school boards must squarely face the issue of whether to plan for basketball and football only, or to plan for the physical fitness needs of all students. I believe the war has taught sensible people that there can be only one solution to this problem, namely, that facilities must meet the needs of all boys and girls.

The continuation and expansion of athletic programs as a part of physical education seem assured. The importance of interscholastic and intercollegiate participation in developing physical fitness, team play, and competitive spirit has been amply illustrated by the records of school and college athletes in the war. It is safe to predict that the post-war period will see a considerable expansion in the number and variety of school and college athletic teams. Whereas now the common practice has been to have one team represent a school in a sport, I believe we can expect to see a trend toward having two or three school teams in each sport. We may also expect to see an increase in the number of sports in which schools participate on an interschool basis. The practice of limiting interschool competition to football, basketball, baseball and track also limits the opportunities which a large number of students might have to receive the benefits of athletic participation. Boys who may not have particular abilities for the sports mentioned above may have abilities which will allow them to compete successfully in activities such as swimming, boxing, wrestling, tennis, golf, handball, soccer, touch football, and field hockey.

The amount of expansion that may be expected in interschool competition for girls is a moot question. It is possible that we may see, within limited areas, a

Page facing—Balance walking, gymnasium, New Trier High School



Right—Wall scaling in the gymnasium, New Trier High School



growth in interschool competition under the professional supervision of women, under special regulations, and in selected activities.

Needs for facilities to meet increased programs of interschool and intercollegiate athletics have already been referred to as an element in the total program. Such increased athletic participation will, however, call for many more fields, courts, and sports buildings.

#### Facilities for a Well-Balanced Program

*Lesson 4. Activities designed for development of physical fitness must improve strength, endurance, speed, agility, coordination, basic motor skills, and competitive spirit.*—The development of these qualities calls for strenuous activity prescribed under sensible standards of progression and continued to a point at which the development attained exceeds the requirements normally expected. Adequate physical fitness cannot result from soft, easy exercise discontinued at the first feeling of tiredness.

The war has indicated that programs of physical education must insure a basic minimum physical fitness to all normal boys and girls at each school level through college. Beyond basic requirements, programs should continue to teach recreational skills in activities that can be carried on in later life. At the same time, students must be required to maintain the basic level of fitness indicated for needs of particular individuals.

Types of activities now being used to develop physical fitness include such athletic team games as football, basketball, soccer, and hockey; conditioning exercises; boxing and wrestling; track and field; obstacle course running; open country running; commando and ranger activities; tumbling and gymnastics; and functional swimming. The program for girls includes swimming, gymnastics, dancing, conditioning exercises, and sports and games.

In many schools the facilities for the activities regarded as essential are so limited that only certain activities can be carried on. The war has revealed, for example, that there is a great shortage of swimming pools in high schools and colleges. A considerable proportion of men inducted into the Army and Navy have been found to be unable to swim and maintain themselves in water.

Greater use will need to be made of existing athletic fields. Fields can be adapted to interchangeable use for football, soccer, and field hockey by providing sunken sockets for removable goal posts. However, such measures are makeshift devices. Attention should be focused upon the acquisition of more playing area.

Reference has been made to the many school gymnasiums which provide only a basketball floor and bathing and dressing facilities for team members. An adequate physical fitness program cannot be carried on unless equipment such as mats, climbing and vaulting apparatus, and space for varied class activities are provided. A single football field will not permit suitable instruction in outdoor team games. Additional fields, courts, obstacle courses, and running tracks will have to be provided if a well-balanced program is to be carried on.

#### Supplies

*Lesson 5. The development of physical fitness requires the use of adequate amounts of supplies or labo-*

*ratory equipment.*—In order to play football, footballs are needed. In order to play basketball, basketballs are needed. In order to play soccer, soccer balls are needed. Our conception of provision of laboratory materials for physical education has been based upon a philosophy of scarcity. This way of thinking is perhaps a carry over from school athletics which consisted of having two teams in a sport. When classes consist of from 40 to 100 boys or girls adequate instruction and participation cannot be secured unless sufficient amounts of equipment are available to keep everyone busy.

During the war schools have experienced a great shortage of balls, mats, ropes, and other equipment and supplies. The shortage has been due to the need of the armed forces for some materials and for very large amounts of athletic equipment. After the war schools must be ready, not only to make up shortages, but also to double or triple the amounts of supplies used before the war.

#### Facilities for Testing Programs

*Lesson 6. Improvement in physical fitness can be measured.*—Our military forces have made use of simple tests, in use in a few schools and colleges for some time, that show evidence of the extent to which the physical fitness of inductees has been improved by Army and Navy physical training and health programs. Schools and colleges are now, more than ever before, using tests of strength, agility, speed, coordination, endurance, and general motor ability. They are making greater use of objective performance standards which can be used as goals and as measures of achievement.

In post-war programs there will most certainly be a vastly increased use of objective test and measurement procedures designed to set before the student goals of attainment, to serve as measures of improvement in physical fitness, and to assist in the evaluation of instructional programs.

Facilities and equipment for testing programs will be in greater demand after the war. Although many of the most valuable test procedures require little or no equipment, the use of such apparatus as dynamometers, spirometers, calipers, scales, posture measuring instruments, horizontal bars, parallel bars, jump and reach meters, stop watches, jump standards, and obstacle courses may be expected to increase. A few new pieces of apparatus to meet particular needs may also appear.

In the future no gymnasium can be considered modern unless it provides testing apparatus, suitable space for its use, and storage facilities that are readily accessible.

#### Classroom Facilities

*Lesson 7. War training programs have accentuated the importance of visual education.*—The extensive use now made of films, slides, posters, and other visual aids may be expected to continue after the war.

Modern gymnasiums should be equipped for showing films to physical education classes. A projection room with proper equipment belongs in the fitness education unit of each large high school and college or university. Such projection rooms would be improved by inclusion of free floor space, so that exercises applying the lessons of the film might take place simul-



Girls' soccer (from the Physical Fitness Manual)



Basketball, E.M.I. vs. Maryland



Giant volleyball, State University of Iowa

taneously with the showing or when the film is stopped and lights turned on.

The development of equipment which will permit showing films in daylight to gymnasium classes, or in portable form to outdoor classes, is a challenge for the future.

Fitness education units should include one or more classrooms. These rooms should be equipped with movable chairs with writing arms, folding dividing partitions, ample blackboard area, projection equipment, storage closets, and running water. Such rooms would be used for a variety of purposes including health instruction classes, first-aid practice, lectures and demonstrations, motion picture projection, club meetings, and quiet game rooms.

#### Camping Facilities

*Lesson 8. Open country activities and sports are essential for training in the practical physical activities of life in the open.*—Very many young men have been found to be unfamiliar with outdoor life, camp craft, and cross-country hiking, climbing, boating, and a general knowledge of how to maintain themselves in the open.

Facilities for instruction in outdoor activities are not available at many schools and colleges. However, some high schools and many colleges and universities have areas close at hand that could be used for instruction in skills and knowledge of outdoor living. Such schools could make much more use of available areas in connection with their physical fitness programs. In future school and college planning, consideration should be given to availability of open country areas.

A camp site and camp facilities for day camping, over-night, and summer camping would make possible instruction in physical fitness activities, camp craft,

and other school subjects in which a first-hand contact with nature in the rough constitutes an essential laboratory.

#### Community Use

*Lesson 9. The promotion of physical fitness is a problem for the whole community. It is not a problem for the school only.*—A coordination of the efforts of the home, school, church, recreation department, health department, industry, and private organizations is essential to meeting the physical fitness needs of all elements in the population.

Post-war planning will need to recognize the importance of extended use of school facilities for community recreation and other community activities. New school buildings should be designed so as to make possible the use of specific features of the building and grounds for community purposes beyond school hours. In this way buildings, grounds, and equipment may be made accessible for community recreation programs.

The location of school buildings, if made with due consideration to community recreation needs and to existing areas, could help to prevent the duplication of facilities or the entire lack of facilities found in many communities.

#### And Personnel

The war has made painfully plain to us that national fitness is a prime consideration in national preservation. In the maintenance of fitness, schools and colleges have important functions to perform. Apathy regarding school health and physical education must be overcome. Schools and colleges will need greatly increased facilities and more professionally trained personnel if they are successfully to play their part in the promotion of national fitness.



# COLLEGE DORMITORIES

By WALTER D. COCKING

**D**URING the past decade, THE AMERICAN SCHOOL AND UNIVERSITY has had the pleasure of publishing a series of articles on college dormitories. Written by architects and directors of dormitories who have made special studies of the complex problems in connection with the designing, construction, and operation of dormitories, these articles undoubtedly have helped to describe distinct trends which have evolved. Fifteen years ago, a college dormitory was largely a place where college students slept, ate, and studied. Today it is much more than that. A modern dormitory is an integral part of the educational equipment. Indeed it is probably the most important type of equipment which the students will use. How necessary then to give constant and continued study and experimentation in an effort to improve the planning, construction, and use of the dormitory to the end that the student may receive the greatest benefit from it. Such an idea even a decade ago would have been considered visionary and unrealistic. Yet today, the dormitory in many institutions is an important educational laboratory.

It has been considered that a brief review of the articles on dormitories which have appeared in THE

AMERICAN SCHOOL AND UNIVERSITY would be helpful in discerning the trends.

### Titles of Articles

The following articles on Dormitories have appeared in THE AMERICAN SCHOOL AND UNIVERSITY since 1930:

Douglass Hall, A New Dormitory for Men at Wooster  
New Dormitory at University of Oregon Pays for Itself  
A Fireproof Dormitory at a Cost of \$1000 per Resident  
Student Residence Halls—New Model  
The Operation of College Houses at Smith  
Planning Men's Dormitories for Today and Tomorrow  
Dormitory Design and Equipment  
Dormitory Design  
Housekeeping as an Administration Problem  
Mary Mayo Hall at Michigan State College  
Planning Kitchens for Residence Halls  
How Proper Building Design and Equipment Can Lessen Problems of Residence Hall Managers  
Designing of College Dormitories  
Dormitory Planning  
Aspects of Planning and Management of Cooperative Residence-Hall Food Service  
Low Cost Residence Hall for Men

### Analysis of Articles

These 16 articles were written by seven architects, seven managers or directors of dormitories, one college



Dormitory at Baldwin-Wallace College. From "A Low-Cost Residence Hall for Men," in The American School and University for 1942

teacher, and one under the joint authorship of an architect and dormitory director. Dormitories in all sections of the country were described although the preponderance (nine) were in the Midwest. Most of the articles discussed a variety of dormitory problems. An analysis reveals the following topics (ranked in order of frequency of mention) which came in for major consideration:

1. Dormitory equipment
2. Planning dormitories
3. The social rooms
4. Dining rooms and kitchens
5. Cost
6. Philosophy of the functions of dormitories
7. Social rooms
8. Bedrooms
9. Materials used in construction
10. Management of dormitories
11. Size of dormitory buildings or units
12. Toilet, bathing, and plumbing facilities
13. Financing dormitory construction and operation
14. Aesthetic appearance of buildings
15. Dormitory floors
16. Heating and ventilating
17. Dormitory lighting
18. Decorating
19. Safety
20. Windows
21. Health features

#### Trends

It is interesting to note the changing emphasis which was given to various topics and problems in these articles. In the early 'thirties, attention seemed to be primarily directed at dormitory equipment, designing of buildings, plumbing features, materials of construction, and cost of buildings and their operation. In the later 'thirties and early 'forties, emphasis was given to the philosophy regarding the place and function of the dormitory in college education, planning procedures in determining dormitory needs and functions, size of structures and units, dormitory dining rooms and kitchens, and proper social room facil-

ities. Such problems as equipment, designing, materials of construction, and cost continued to receive attention throughout the entire period.

As one reviews these reports he must conclude that the function ascribed to the dormitory changed considerably during the period. Less attention was given to the dormitory simply as a boarding house or place to hang one's hat, much more emphasis was devoted to the dormitory as an educational laboratory which was of significant importance in a person's education. Emphasis in dormitory management changed from simply keeping the building occupied, maintaining order, and operating economically to conducting the service so that the all-round welfare of students received first consideration. More and more the dormitory manager seems to be becoming an important guidance and counseling official. A similar changing emphasis in the design and construction of the dormitory building seems evident. Much more attention in recent years is being devoted to the functional use of the structure, and to a coordination of all the building facilities to assist the student in a wholesome educational development.

#### What of the Future

It will be interesting to look back at the close of the next decade to note the further changes and developments which have transpired. Undoubtedly they will be many and important. It is to be hoped that college administrators, dormitory directors, student personnel officers, and architects will work together and pool their efforts to continue the improvements of dormitory facilities. Much has been done. Much more can be done through coordinated effort. One last word,—Isn't it time that the students themselves be given a much greater part in dormitory planning and management. After all they are the ones most concerned. Out of their experiences of dormitory life much can be learned which should lead to progress in the future.

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# PLANNING A UNIVERSITY LIBRARY

By RALPH E. ELLSWORTH

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ONE disturbing aspect of the problem of post-war university library construction is the fact that we may not be able to take full advantage of the opportunities offered us. That is to say, it now appears that a vast construction program will be needed immediately following the time factories cease production of war materials. Information on new methods, of new construction materials and inventions useful in libraries, and information on what the post-war university will be like are not available now, and probably will not be until some time after demobilization.

Thus, we face the prospect of having to be ready with library plans without full knowledge of how to build and without knowing what the library is to be used for. This situation calls for wisdom and luck, especially the latter. It may be, of course, that financial considerations may delay construction long enough to cover the lag, but this is not likely.

## The Trend in University Education

Although the nature and needs of the post-war university cannot be understood now, it is possible to study developments in recent years and from these draw some conclusions as to what the forward-looking institutions will be trying to do. Some of the needs of post-war students are already clear to us. Others will appear in the near future.

It would seem appropriate, therefore, to discuss some of the principles that will be helpful to university

library planners, both in anticipating library needs and in establishing sound construction principles.

Dean Carl E. Seashore published in 1943 a fine condensation of where university education is headed.<sup>1</sup> His decalogue, translated into terms of future action, would be as follows: universities will work more in the direction of recognizing individual differences, making education student centered, building a basic individual program, organizing training for self-help in learning, making motivation the chief medium of instruction, eliminating the lock-step in assignment and promotion, integrating the university with community life and career, fitting the university into a continuous process from cradle to grave, being more accurate in awarding praise and blame on the basis of capacity, and developing the individual into a well-rounded personality.

## Learning Laboratories, Not Monuments

Post-war universities will strike out in many new enterprises, but it is likely that these ten principles will dominate what the best universities try to do. From these principles, and from other facts that are self-evident, we can draw certain conclusions about what university libraries should be like.

First, the library will be the place where a large share of individual and small group counseling and instruction will take place as a substitute for large

<sup>1</sup> Carl E. Seashore, "An Educational Decalog." In *School and Society*, November 6, 1943, Vol. 58, no. 1506, pp. 353-358.



The Library at the University of Colorado, Boulder (front view)



class lectures. That is, instead of herding 200 students into a lecture class for Economics I, we might give each student a syllabus, a guiding textbook, a schedule of examinations, and a corps of instructors in the library who can help him when difficulties arise.

Second, the library will have to be prepared to absorb and make available materials that have been considered as non-library. A social science or humanities library calls for pictures, slides, maps, phonograph records, models of buildings, cities, and machines, and other devices that will enable the instructors to bring life situations into the library for dissection and analysis. Books will be used alone and also with laboratory materials according to the needs of problems.

Third, the library will have to be prepared for the idea that there will be a merging of its staff with that of the instructional staff. The job of technical preparation of materials may remain, but on the interpretation side the librarian and the instructor will tend to become the same person or persons. This does not force librarianship down, it raises it up.

These considerations lead to the inevitable conclusion that flexibility is a factor of major importance in planning a university library—flexibility in expansion and flexibility in internal arrangement.

Flexibility in expansion for a post-war library might well be based on the assumption that the first unit should be adequate for 30 years and be capable of being expanded to five times its first size. Further, the building should be so planned that the unity of control should be as good at the end of the fifth expansion as at the first. Further, the cost of construction must be low enough to make possible this degree of expansion without costing the university an unreasonable amount of money. This means that the idea of the monumental building, such as Yale's, will have to be discarded. We must build learning laboratories, not monuments.

Flexibility in internal management is more difficult to achieve and certainly it cannot be done adequately

in a building that has permanent and fixed inner partitions and floors.

The most fruitful method of construction that follows these principles would seem to be the unit plan proposed by Githens and MacDonald in 1933.<sup>2</sup> This system is completely flexible, and permits the kind of library activities that will be called for if the ten principles are followed to any extent. Indeed, this type of library organization would fit the needs of universities today better than do most of the libraries now in existence.

In general, the unit plan system works as follows: Exterior walls are built with no permanent fixed internal construction except for certain service functions such as toilets, cloak rooms, lobbies and stairways. The interior of the library is built on the basis of a steel skeleton of carrying columns spaced every 9 feet, and floor levels every 8' 6" attached to the columns. Between any two steel columns can be hung either shelving, partitions, or a combination of the two, and these are interchangeable at any time. The vertical columns can be made to carry lighting and ventilation conduits.

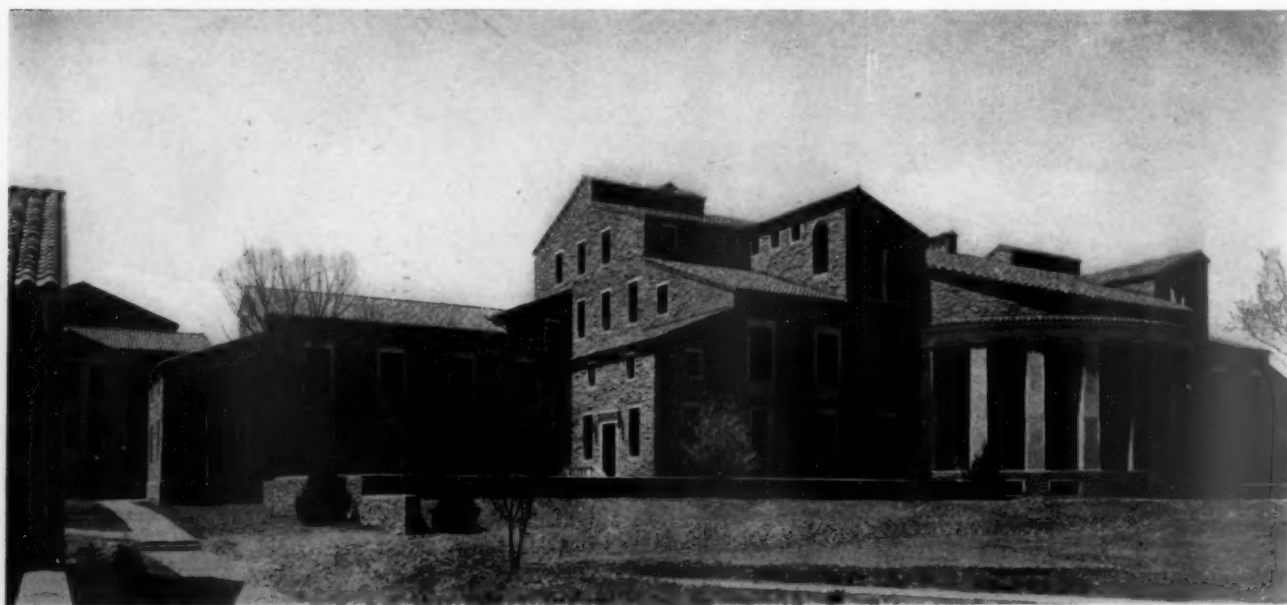
This method of construction allows one to lay out space according to present needs and to change the layout as needs change.

There would be no fixed reading rooms as we have known them in the past, i.e., general reference, reserve, periodical, etc.—and the closed stack unit would be greatly contracted. Instead, reading laboratories are achieved by running alternative rows of shelving and tables in a given area which is surrounded by classrooms, carrels, sound-proof rooms, workrooms, seminars, consultation rooms, and faculty studies.

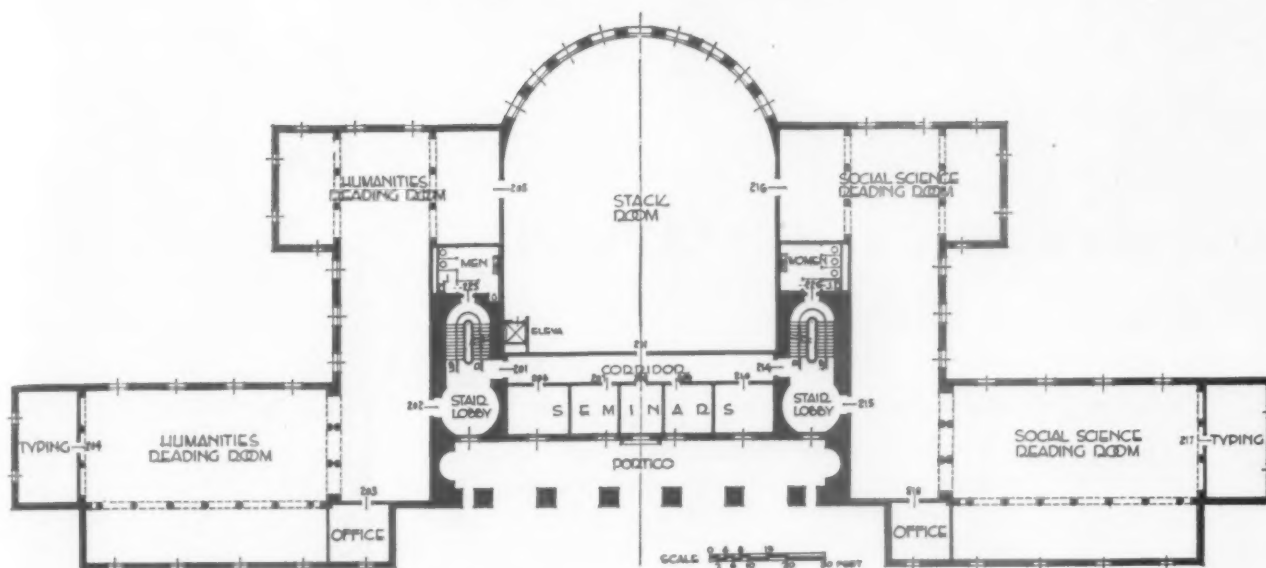
Each reading laboratory area can be built around departmental programs, special projects, or divisional programs.

To work out the first allocation of space one would

<sup>2</sup> A. S. MacDonald, "The Library of the Future," In *Library Journal* 58, 971-5, Dec. 15, 1933.



The Library at the University of Colorado (rear view)



Office of Charles Z. Klauder, Architect; T. H. Buell & Co., Associates

The University of Colorado Library attracts visitors from all over the country because of its unusual plan and method of operation. This second floor plan shows the flexibility of the internal construction, the allocations of space to departmental programs, the seminar rooms, and the relation of the reading laboratories to the stack room.

study the departmental programs and attempt to translate them into a floor plan. This would be shifted and enlarged as experience and possibilities cumulate.

This plan obviously calls for a major shift in attitude on the part of the architect, the librarian, the teaching staff, and the university administrators, for a library built in this way does not give the architect an opportunity to create the kind of atmosphere within the library that is traditional. Such a building will dominate the campus in terms of its activities, but not architecturally. The exterior, of course, can be as beautiful and imposing as desired, providing the exterior does not interfere with internal functioning.

#### Social Studies Area, For Example

From the point of view of the faculty, this plan provides a place where the finest kind of teaching can be done. To illustrate what some of the possibilities are, the following description of quarters for a history department is presented.

In the social studies area, history materials form the nucleus. In the history reading laboratory, there would be seating space for perhaps 300 students, and shelf space for 5,000 books, periodicals, etc. Adjacent to the central reading area would be six consultation rooms and twenty faculty research studies, each 9 x 9. In the consultation rooms, there would always be available faculty members and librarians to work with individuals or small groups of students who wish to discuss problems in relation to courses or projects. Six seminar rooms, each 18 x 27, capable of seating 30 students, and 2,000 books would be provided. There would be several workrooms where untreated source materials and collections could be worked on by faculty and graduate students, and, of course, map rooms, phonograph record playing rooms, slide and film rooms, and special collection rooms.

This space might be used primarily for upper division and graduate students. A lower division or general education library might be maintained as a separate unit to meet the special needs of lower division or general education students.

The main collections in the history reading laboratory would consist of the basic teaching and research file of books and journals, some on reserve and some not. In the seminar rooms would be placed on a temporary basis, the materials an instructor wanted to use for a particular purpose. In the carrels, a graduate student would keep the materials he was using on his own project. The special collection rooms would house valuable collections, or those that have to be kept intact. The workrooms would be used for unsorted or untreated collections. The out-of-date or "dead" history materials would be kept in the central stack space in the building.

Most of the history materials would be on an open shelf and under the supervision of a librarian in charge of the social studies. In addition to her normal library duties, she would work in and out of the instructional programs in one subject field. As assistants she would have apprentice scholars who would be receiving first-hand experience with the handling of students and printed materials. This experience might be considered more valuable than the traditional paper grading activities of graduate assistants.

Access to the social studies area would be central and carefully controlled.

#### Plan Applicable to Entire Building

This brief description suggests how the entire building could be planned and developed.

There will be, of course, universities that will not care to go this far in post-war library construction. For these, the standard kind of university library, with modifications, can be used. For such there is an adequate body of literature and experience.

# INITIATING AN AUDIO-VISUAL DEPARTMENT

Naval experience teaches schools and colleges how  
to establish effective audio-visual programs<sup>1</sup>

By FRANCIS W. NOEL<sup>2</sup>

Lieut., USNR



MILLIONS of men and women in the armed forces and in industry have discovered that learning can be interesting, that they can learn more, learn better, and learn faster when their teachers properly use the modern educational tools known as audio-visual aids. To soldier, sailor, marine, and war worker, these aids—instructional films, filmstrips, radio, recordings, models, charts, flat pictures, and the like—mean more learning in less time.

## The Demand Exists

As a result, alert and forward-looking educational leaders are convinced that adequate provision must be made now for the use of these resources. They know that millions of men and women will return home when the war is over to demand for their children the advantages of these modern teaching-training-tools. Educators and the public are already aware of this and are asking what can be done about it. Despite wartime restrictions, much can be done now.

## Materials Are at Hand

A check-up on the part of many school superintendents should reveal a surprising amount of audio-visual equipment and materials on hand. Quite likely these materials are not being used to full advantage in terms of school-wide possibilities unless

someone has been responsible for their use. What is everybody's business rapidly becomes nobody's business. When no central authority is responsible for the materials they quickly become forgotten and relegated to closets, drawers, and storerooms. Special departments often have exhibits, slides, posters, and pictures that would be useful in other classes. This is particularly true of science, industrial arts, and home economics subjects. Thus an investigation of existing materials and facilities may unearth unsuspected wealth in these aids.

## Put Resources To Work

With the extensive revision most school curricula have undergone in the past few years, there are now new applications for these materials. An audio-visual use committee should be appointed to appraise the materials available and discover applications for their use.

Along with its other duties, such a committee should help teachers develop an understanding of basic concepts in the use of audio-visual teaching tools. It should help them become familiar with audio-visual equipment, and everyday sources at hand of simple materials such as *Life*, *National Geographic*, and *Fortune*. It should arrange demonstrations of good utilization techniques and encourage the study of literature in the field. Such books as *Visualizing the Curriculum*, by Hoban, Hoban and Zisman, American Council on Education Motion Picture Study Reports, and current magazine articles will do much to acquaint teachers and administrators with the thinking and experience of leaders in this area.

It should be pointed out here that any "faddist," "Messianic," or "get-on-the-bandwagon" approach

<sup>1</sup> Editor's note: The views expressed in this article are those of the author and in no way represent an official expression of the U. S. Navy Department.

<sup>2</sup> A note about the author: Lieutenant Francis W. Noel, USNR, is Director of Audio-Visual Education on leave in the U. S. Navy from the Santa Barbara, California, City and County Schools. He is author and co-author of many articles in this field including an American Council on Education Motion Picture Project Study report, "Projecting Motion Pictures in the Classroom." His present duty assignment is Officer-in-Charge of the Utilization and Evaluation Unit in the Training Aids Section, Training Division, Bureau of Naval Personnel.



should be quickly discouraged. Teacher growth in the use of audio-visual materials must be based upon a sound application of what is known about "how we learn" and what is known about the techniques and art of good teaching. Teachers themselves must be represented on this committee for the program is, after all, *their* program. They are the users of audio-visual aids. Such participation, moreover, pays dividends in greater personal enthusiasm and more effective utilization.

#### Audio-Visual Planning Committee

Assuming the superintendent is sincerely desirous of developing the most effective service possible, the next step is to create an audio-visual *planning* committee in addition to the audio-visual *use* committee. The work of this committee is to study the over-all audio-visual needs of the school system and to make recommendations accordingly.

It is extremely important that long-range plans be made. An audio-visual service cannot be developed into a blooming flower in one year, nor two. Many years are required. It involves not only the provision of suitable facilities for housing and using the aids, but the gradual acquisition of equipment and materials. Fully as important as the physical aspects are those of in-service teacher training for effective utilization and evaluation. The program must be planned as a whole and each aspect considered in terms of all others if steady, healthy, permanent, and well-balanced growth is to be achieved. These problems call for careful study, thought, and direction from the committee. Its understanding and foresight will have a profound effect on the program for many years ahead.

#### The Public Must Participate

There is ample intensive public interest in this movement. It is something that people can easily understand, and their support is assured. Public funds will have to be spent to provide audio-visual services. Hence, at this point, the public should be represented and taken into confidence and conference. In addition to school representatives, the planning committee might include (1) a parent-teacher's association representative, (2) a school board member, (3) a community-minded businessman, and (4) if possible, a public spirited representative of the press. Such a committee, when carefully chosen and



Display at a Navy training aids development center

competently chaired, becomes the prime mover in the development of an adequate audio-visual program.

A knowledge of basic objectives is vital to the committee in its work. What are the basic objectives of an audio-visual service? They are (1) to provide as economically as possible a wide variety of proved audio-visual equipment and materials in quantities sufficient to meet the growing needs of the schools, (2) to help teachers select aids in terms of instructional needs and (3) to help teachers obtain the best possible results from these aids. Objective three requires continuous evaluation as a basis for up-grading the whole program.

Time spent by the superintendent in working with this committee will be one of his wisest investments and will return rich dividends to the public, to the teachers, and to the school pupils. It is extremely important for him to make the work of this committee a first order of business. The committee's enthusiasm for its work can render it one of the best devices for improving educational public relations that any school administrator could hope to have.

#### Advantages of a Central Department

The most efficient and economical means of providing these services is a central audio-visual education department, one large enough to warrant a full-time director. A single school unit may logically function as part of the established school library; but, in city or county systems, the audio-visual unit should stand on its own feet. To date most attempts to combine with library services on a large scale have proved ineffective. Each is a specialized field with its own materials, problems, and philosophy. Their individual importance more than justifies separate organization.

The advantages of a central department are so numerous that where individual schools are faced with financial limitations an effort should be made to develop a department cooperatively. Even though schools may be independent political units there are ways of pooling resources for the development and maintenance of a service of this type. Cities as small as forty thousand population, by beginning modestly and planning carefully, can provide central services with at least a part-time director. County superintendents' offices are logical centers of such services. Progressive teachers colleges have a real opportunity to provide audio-visual aids for outlying schools. The in-service teacher training program necessary for



A Navy training aids library, Sixth Naval District



The Navy has used more than 250 million feet of 16 mm positive film for training purposes

Official U. S. Navy Photos

effective utilization fits ideally into the program of such an institution.

#### **A Competent Director Is Needed**

The director of audio-visual education, in the long run, is the person who will make the program a success or failure. Selection of a competent person to fill this position is the superintendent's most important single contribution to the program.

What sort of a person should he be? For smaller systems a man is preferable because of inevitable requirements in handling equipment. In large departments with a staff including men, sex makes no difference; it's the competence of the person that counts. Minimum requirements desirable include (1) an education at least equal to the highest requirements for teachers; (2) some classroom teaching and administrative experience; (3) a basic understanding of curriculum procedures (many of his duties make him, in effect, a curriculum assistant); (4) a pleasing personality—one able to speak and to meet the public; (5) a great personal resourcefulness in finding ways to do the impossible; (6) ability to organize; (7) leadership; (8) a contagious enthusiasm for his work; (9) a practical creativeness for devising ways to visualize ideas; and (10) if possible, a working knowledge of photography and some of the technical aspects of equipment.

It is realized that this is a big order and that there are few men or women available at present who can fill the bill. After the war there will be men and women from industry, government, and the armed forces, who have these qualifications and who will have the advantage of broad experience and special training in the development and direction of audio-visual utilization programs.

#### **Physical Aspects of the Program**

##### *Adequate Central Housing*

One of the first items of consideration is adequate housing, centrally located. Audio-visual aids must

be readily accessible for inspection and selection by teachers. A preview room for showing instructional films and other projection aids must be provided. The aids must be protected from fire and undue deterioration. (Instructional films are nonflammable and constitute no fire hazards.) An unused portion of a school can easily be put to good use. Where only one school is concerned, space can in most cases be found and adapted when the need for it is apparent.

##### *Equipment*

Plans should anticipate eventually providing each school with at least (1) a sound 16mm motion picture projector, (2) a combination 2" x 2" slide and strip film projector, (3) a portable radio, and (4) a dual-speed portable transcription player. While equipment can be shifted from school to school, such movement inevitably leads to considerable damage requiring expensive repairs and frequent adjustments.

##### *Acquisition of Films and Other Materials*

While the purchase of films is expensive, renting is even more so. Few schools have the resources to purchase a large number of films in any one year. A rental-and-purchase program is one solution. At least one educational film producer offers a lease-to-purchase plan wherein a school may select and take immediate possession of fifty subjects at an extremely low rental rate which eventually effects the purchase.

Renting of some films is necessary for an adequate selection of subjects. Entertainment film which is extensively used in many school systems, but which is shown only once to a group, should probably always be rented. It is understood, furthermore, that many of the smaller school systems will find it largely necessary to use the rental plan indefinitely because of the capital outlay involved. However, it is well to remember that renting films is like renting a house. In the long run the school pays for the films, but another agency owns them. Rented films, moreover, are seldom available just when they are needed. Repeated

use is desirable and rented films cannot be retained with economy over long periods.

Filmstrips, slides, recordings, flat pictures, models, charts, and other audio-visual materials, are available from many sources. A preview committee, comprised of curriculum coordinators, teachers, and students should help select these materials after a preliminary sifting by the director and his assistants.

#### *Provisions for Maintenance*

Audio-visual materials and equipment wear out and occasionally become damaged. Space, tools and personnel must be provided to maintain service at peak efficiency. In a single school this may take the form of a workbench for rewinding, splicing, and making of minor repairs to charts, models, and other items. In a central department a workroom should be provided for this activity.

#### *A Distribution System*

Audio-visual aids must be delivered on schedule. From the standpoint of the teacher this should entail no more time and effort than is required in procuring a book. For a central department this calls for a delivery service operating on an established schedule to the various schools.

#### *Preparation of Classrooms*

Audio-visual aids are here to stay, and school architects must henceforth take them into account. Along with proper heating, lighting, and ventilation, we must have proper room darkening. This is an administrative problem which should have high priority in school systems inaugurating an audio-visual service. How the job shall be done depends greatly on the size and affluence of the system concerned. For both old and new construction heavy denim curtains are recommended.<sup>3</sup> The ideal is—every room an audio-visual classroom. In old construction where not all classrooms are used, one room can be darkened by painting the windows with an opaque paint. It is better, however, to initiate a program leading eventually to curtains in each of the classrooms. A few can be in-

<sup>3</sup> Francis W. Noel, "Teaching with Motion Pictures," American Council on Education Studies, April, 1937.

stalled each year. For new construction, it is a mistake to provide a special audio-visual aids room. Many classrooms permitting more extensive and intensive use of the aids, can be provided with excellent darkening and ventilating facilities for the price of one special room.

#### *What About the Cost?*

Did someone ask the price of admittance? If so, the question is in order. Do you think an informed community would be willing to add to its school budget the equivalent of one four-bit theater admission a year for each student in order to assure such obvious benefits for its children. Conceivably, this may be too ambitious a beginning. Perhaps a two-bit show is the best you can do as a starter. But once the program is underway and parents realize what it is doing for their youngsters—when they know what it costs in terms of Saturday matinees—they'll be good for a two or three show contribution per year, and will consider the money well spent. They will also find that additional investment in a four-bit show will bring substantial growth and progress.

#### **Opportunity To Win Public Confidence**

The writer has had extensive experience working with lay people on audio-visual problems. Curiously, it is harder to work with educators on audio-visual values and possibilities than it is to win the cooperation of the lay public. This movement is dynamic. One doesn't need to be an educator to understand it. There has never been a movement in American education which has so caught public interest and approval and, at the same time, a movement which has its roots deep in the soil of sound educational psychology and good instructional practices. Educational leadership is faced with a real and an important challenge. It must begin to lay plans at once. Here lies a rare opportunity for administrators and school people to win public confidence and backing. This thing is, in fact, so big and the forces behind it so powerful that if school leadership and direction fails to materialize, the initiative will be grasped by other agencies. Given able leadership it can become as important to education as the invention of the printing press.



Studying positions with the use of a chart and models



Training aids in use at an advanced base



# COLLEGE SCIENCE PLANT FACILITIES

By WALTER D. COCKING

MANY colleges are faced with the problem of building entirely new science facilities or adding extensively to present ones in the early years following the war. Plans in many cases are being made now. The account which follows has been prepared to call attention to much helpful material readily accessible in previous editions of *THE AMERICAN SCHOOL AND UNIVERSITY*, and which college administrators, science faculties, and architects should find exceedingly helpful.

## Subjects and Authors

The articles dealing with science laboratories in colleges and universities may be grouped as follows:

1. Four articles by Dr. W. B. Foulk, Curator of the famous Frick Chemical Laboratory, Princeton University, which dealt with various phases of the problem of servicing the laboratory.
2. Eight articles on the science facilities at certain institutions
3. Two articles on special science facilities in two teachers colleges.
4. Two articles on chemical laboratories
5. One article on physics laboratories
6. One article on biology laboratories
7. One article on tables for physiology laboratories

The authorship in large part was brilliant and competent. As a result this body of materials is some of the most authoritative and valuable in the field of the physical facilities for the sciences at the college level. Seventeen of the 19 authors were scientists, many of them distinguished in their special fields, and two were architects who have had considerable experience in the planning of science buildings.

## Servicing the Physics Laboratory

A brief review of the various series of articles may prove helpful. Dr. Foulk in his series on servicing science laboratories dealt with four phases of the problem: (a) servicing a modern laboratory from a central delivery room,<sup>1</sup> (b) issuing supplies to undergraduate laboratories and auxiliary services,<sup>2</sup> (c) acquisition of apparatus and supplies,<sup>3</sup> and (d) perpetual inventories and accounting methods.<sup>4</sup>

Dr. Foulk in the first article described a central system and the training of attendants versus a system of small delivery rooms and proposed a combination of the two plans. He then discussed various service facilities, including elevators and dumb waiters, shelving, a classification system for storing apparatus, an index and labeling system, special cabinets, storage of non-glassware materials, storage and dispensing of chemicals, and service counters.

In the second article, Dr. Foulk gave special atten-

tion to issuing supplies to laboratories for undergraduate students, and discussed the services involved. This article is based on actual practice followed at the Frick laboratories. Among the topics treated were delivery rooms, chemicals on reagent racks, distribution of chemicals for experiments, facilities for preparing solutions, distilled water and hydrogen sulfide distribution, use of cylinders of compressed hydrogen sulfide gas, issuing and checking apparatus to students, care of instruments and special equipment, repair of glass apparatus, care and maintenance of special expensive equipment, reconditioning of metal equipment, care of lecture preparation room and its equipment. The article concludes that money expended for a service staff of trained attendants pays dividends.

The acquisition of laboratory apparatus and supplies was given consideration by Dr. Foulk in his third article. He discussed filing catalogs, quantity purchasing, securing quotations, comparison of prices, placing orders, card file on all commodities purchased, filing of orders and invoices, checking goods received for quality and quantity, purchase of chemicals, receiving and service rooms, the glassware laundry, and special storage rooms for chemicals of a highly explosive or inflammable nature. He concludes by stating that "conservation of funds . . . are dependent upon threefold activities: first, the knowledge of what and how much apparatus and supplies should be acquired . . . ; secondly, selecting the needed articles wisely . . . ; lastly, conserving the investment by preventing deterioration and waste both in the storage and in the use of supplies."

In the fourth and final article of the series, Dr. Foulk commented on perpetual inventories and accounting methods. Among the topics treated were perpetual inventory and purchase records, checking inventory records, the use of records in purchasing, accounting control of special apparatus and equipment, preparation of an inventory system, description of certain of the forms used, return and inspection of apparatus. The conclusion was "perpetual inventories are essential to the efficient operation of any supply system."

Undoubtedly, Dr. Foulk's four articles are the best and most authoritative materials available on this subject, and form a real contribution to the science library.

## Laboratory Design

During the period from 1930, eight articles describing science facilities at particular institutions have appeared in *THE AMERICAN SCHOOL AND UNIVERSITY*. The list of articles is as follows:

The Biology Wing of the Biology-Geology Building, University of Rochester  
The Science Building at Antioch College  
The New Chemistry Building at Fisk University

<sup>1</sup> *AMERICAN SCHOOL AND UNIVERSITY*, 6th edition, 1933, pp. 298-305.

<sup>2</sup> *Ibid.*, 10th edition, 1937, pp. 436-447.

<sup>3</sup> *Ibid.*, 12th edition, 1939, pp. 465-479.

<sup>4</sup> *Ibid.*, 15th edition, 1942, pp. 373-381.



A view of the laboratory for general chemistry at the Northwestern Technological Institute. Individual downdraft hoods and ample supplies of other equipment enable the students to work without losing time in waiting for apparatus



The facilities of the physics department include the large lecture room shown here, which seats 200 persons

The New Chemical Laboratories at Georgetown University

The Biological Science Building of the State College of Washington

The Hixon Laboratory for Medical Research

Survey of the Bucknell University Science Department

Laboratory Facilities—Physical and Chemical—at Northwestern University

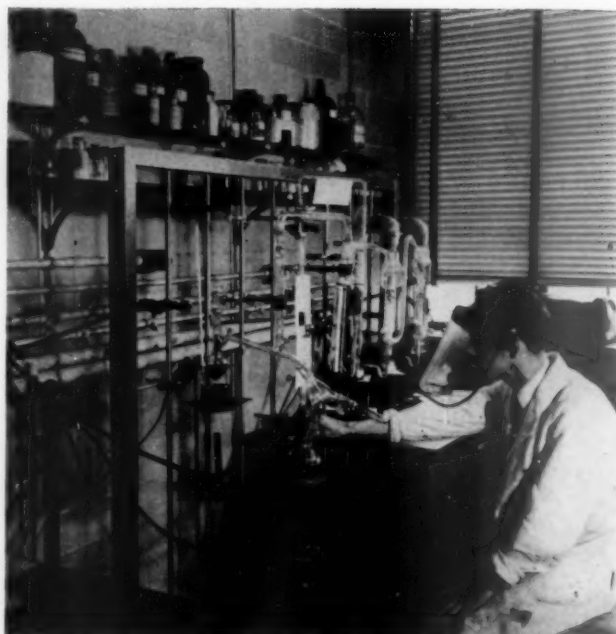
All of these articles describe new buildings or facilities for various sciences which had recently been added to the institution's plant. The account of the planning of these facilities plus detailed description of the buildings provide an important body of data on new developments having to do with the facilities for science teaching and research in American colleges. Undoubtedly college administrators, science faculties, and architects will find these descriptions exceedingly helpful when planning new science plant additions.

#### One Story Units?

It is interesting to note that while all these buildings have certain common elements yet each is unique. Based upon study and empirical investigation, developments of many kinds are constantly incorporated in the new plant. Indeed, one can almost trace the changing points of view in science teaching by studying the developments which have come in the plant facilities for science.

In those cases where the entire science program is housed in one building, ordinarily the basement floor is given over to storage, the first floor to the physics department, the second floor to biology, and the top floor to chemistry. It is apparent that a building devoted exclusively to one science has certain advantages over the multi-use structure. In smaller institutions, consideration should be given to the advisability of constructing one-story unit buildings.

The cost of construction of science buildings is ordinarily somewhat higher than for other plant units due to the necessity of providing for expensive equipment and apparatus. Also the safety factor makes it absolutely necessary that such buildings be entirely fireproof. Much greater attention has been given in recent years to providing more adequate storage rooms and necessary service rooms. Such facilities in older



At work in one of the research laboratories in the Institute

buildings, to the extent that they were found at all, were poorly planned, inadequate in size, and not built with a view to increasing the efficiency of the entire building. Undoubtedly many additional improvements will be made for these facilities in the science buildings of the future.

#### Faculty Planning

Special attention is called to the article by the science faculties of Northwestern University which appeared in the 1943 edition. Northwestern was enabled to plan and build an entirely new technological institute due to the receipt of a gift of \$5,000,000 for that purpose. The article sets forth the planning procedures followed by the physics and chemistry faculties, and describes in detail the building and its equipment. One concludes that systematic intelligent planning does pay and that Northwestern now has most adequate facilities for teaching and research. While all institutions may not be able to expend an equal amount of money, yet it is clear that planning by faculty members is possible and will result in providing a much more practical and usable plant.

Other articles on college sciences programs which have appeared in *THE AMERICAN SCHOOL AND UNIVERSITY* since 1930 dealt with special science facilities for teachers colleges (two articles), chemical engineering laboratories, the servicing of physics laboratories, the maintenance of living materials for biological laboratories, and a special account of the planning and construction of tables for a physiology laboratory. A review of these articles shows the growing wealth of information available as a result of continuing experience, study, and research. There can be little question that the science program of the future will be much more effective if the results of such studies as those reported in *THE AMERICAN SCHOOL AND UNIVERSITY* are incorporated into the planning of new science building facilities.



Preparing apparatus for the physics and chemistry departments in the basement glass shop of the Technological Institute



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**LAW LIBRARY ALTERATION AND ADDITION**  
*Location:* Cambridge, Mass.  
*Architect:* Coolidge, Shepley, Bulfinch & Abbott  
*Owner:* Harvard University

# GEORGE A. FULLER COMPANY

BUILDING CONSTRUCTION (Continued)

## DILLON FIELD HOUSE

Location: Cambridge, Mass.  
Architect: Coolidge, Shepley,  
Bulfinch & Abbott

Owner: Harvard University

## SCHOOL OF GEOGRAPHY

Location: Cambridge, Mass.

Architect: Horace Trumbauer

Owner: A. Hamilton Rice

## RINDGE TECHNICAL SCHOOL

Location: Cambridge, Mass.

Architect: Ralph Harrington  
Doane

Owner: City of Cambridge

## NEWBURYPORT HIGH SCHOOL

Location: Newburyport, Mass.

Architect: Edwin S. Dodge

Owner: City of Newburyport

## NEW YORK

## GOOD SHEPHERD SCHOOL ADDITION

Location: New York, N. Y.

Architect: Paul Monaghan

Owner: Corp. of R. C.  
Church of the Good  
Shepherd of N. Y.

## CARDINAL HAYES MEMORIAL HIGH SCHOOL

Location: New York, N. Y.

Architect: Eggers & Higgins

Owner: Archbishopric of  
New York

## COOPER-UNION (Hewitt Addition)

Location: New York City

Architect: Clinton & Russell

Owner: Cooper Union for  
Advancement of Science

## SCHOOL OF JOURNALISM

Location: New York City

Architect: McKim, Mead and  
White

Owner: Trustees of Columbia College

## GIRLS' COMMERCIAL HIGH SCHOOL

Location: Brooklyn, N. Y.

Architect: William H. Gompert

Owner: Board of Education  
of City of New York

## SPENCE SCHOOL

Location: New York City

Architect: Office of John Russell Pope

Owner: Trustees of the Miss  
Spence School, Inc.

## VANDERLIP SCHOOL

Location: Scarborough, N. Y.

Architect: W. W. Bosworth

Owner: F. A. Vanderlip

## MYRON TAYLOR HALL

Location: Ithaca, N. Y.

Architect: Jackson, Robertson  
& Adams

Owner: Cornell University

## DOBBS FERRY HIGH SCHOOL

Location: Dobbs Ferry, N. Y.

Architect: Knappe & Morris

Owner: Board of Education,  
Town of Green-  
burgh, N. Y.

## PRINCETON, NEW JERSEY

### LABORATORY OF PHYSICS

Location: Princeton, N. J.

Architect: H. J. Hardenbergh

Owner: Princeton University

## NORFOLK, VIRGINIA

### ARTILLERY SCHOOL

Location: Norfolk, Va.

Architect: F. B. Wharton, Q.M.  
Dept.

Owner: War Department,  
U. S. A.

## GEORGETOWN, VIRGINIA

### GEORGETOWN COLLEGE

Location: Georgetown, Va.

Architect: Marsh & Peters

Owner: President & Directors  
of Georgetown  
University

## PHILADELPHIA, PA.

### ZOOLOGICAL LABORATORY

Location: Philadelphia, Pa.

Architect: Cope & Stewardson

Owner: University of Pennsylvania

## BRYN MAWR, PA.

### BALDWIN SCHOOL GYMNASIUM

Location: Bryn Mawr, Pa.

Architect: Fuller Industrial Engineering Co.

Owner: Baldwin School, Inc.

## LAFAYETTE, IND.

### MUSIC HALL—PURDUE UNIVERSITY

Location: Lafayette, Ind.

Architect: Walter Scholer

Owner: Trustees of Purdue  
University

### RESIDENCE FOR MEN—PURDUE UNIVERSITY

Location: Lafayette, Ind.

Architect: Walter Scholer

Owner: Trustees of Purdue  
University

## ANN ARBOR, MICHIGAN

### MARTHA COOK DORMITORY

Location: Ann Arbor, Mich.

Architect: York & Sawyer

Owner: University of Michigan

## CHI PSI

Location: Ann Arbor, Mich.

Architect: York & Sawyer

Owner: Epsilon Realty Company

## CLEVELAND, OHIO

### BOYS' LATIN SCHOOL

Location: Cleveland, Ohio

Architect: Edward T. P.

Graham

Owner: Bishop of Cleveland

## DURHAM, N. C.

### DUKE UNIVERSITY

Location: Durham, N. C.

Architect: Horace Trumbauer

Owner: Duke University

## NEW HAVEN, CONN.

### INSTITUTE OF HUMAN RELATIONS

Location: New Haven, Conn.

Architect: Grosvenor Atterbury, John Tompkins Assoc.

Owner: Yale University

### STERLING HALL OF MEDICINE

(Library Wing Addition)

Location: New Haven, Conn.

Architect: Chas. Z. Klauder

Owner: Yale University

## CANADA

### HIGH SCHOOL

Location: Montreal, Canada

Architect: Edward & W. S.

Maxwell

Owner: Protestant Board of  
School Commissions

### EDMONTON ARTS

Location: Edmonton, Alberta,

Canada

Architect: Nobbs & Hyde

Owner: Board of Governors,  
University of Alberta

### MILL BUILDING ADDITION

Location: Toronto, Canada

Architect: Craig & Madell and  
T. R. Loudon

Owner: Governors of the  
University of Toronto

### ST. MICHAELS COLLEGE

Location: Toronto, Canada

Architect: Arthur W. Holmes

St. Michaels College





# JOHN A. JOHNSON CONTRACTING CORP.

Headquarters: 270 Forty-first St., Brooklyn, N. Y.

General Contractors

WASHINGTON

BROOKLYN

PEMBERTON, N. J.

ATLANTA

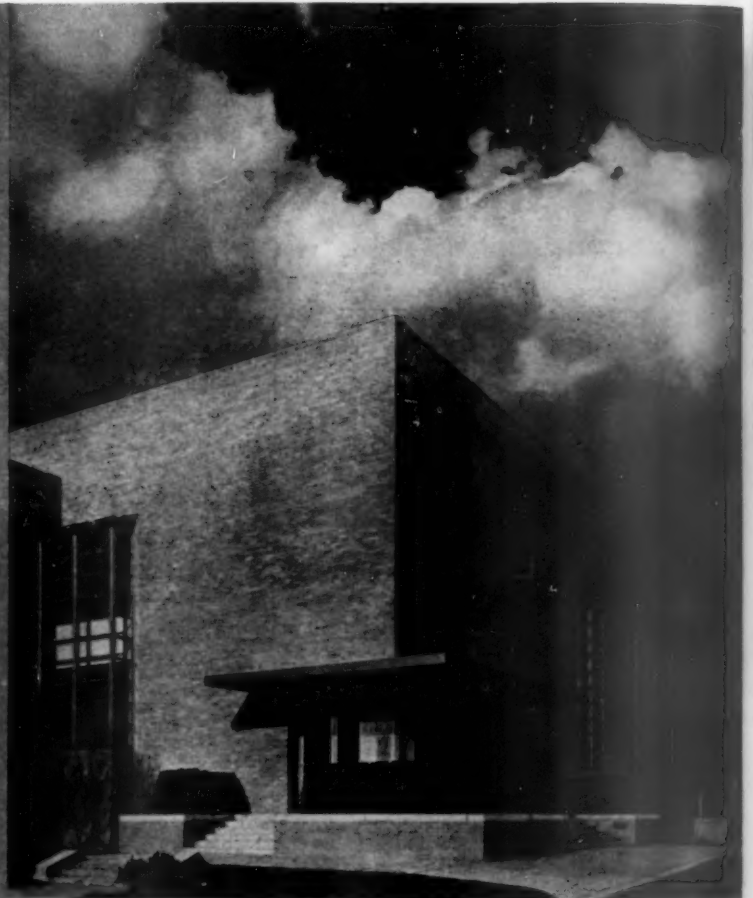
## "OUR TAXPAYERS GOT A LOT OF BUILDING FOR THE MONEY THEY INVESTED . . ."

The recent letter from which the above is quoted was written by the Superintendent of Schools, Harrison, N. Y., District No. 6, Mr. Louis M. Klein, who continued . . . "and 4 years of use of this building have proved it to be a thoroughly well-constructed, practically laid out, and a genuinely usable and functional school building which has been a real asset to our community."

The impressive educational and social results which the School Board of Harrison, N. Y. has attained with this outstandingly-modern functional plant is so immediately apparent that even a layman is deeply impressed.

The precision and efficiency in human relations with which this school entity functions amply justifies the first paragraph of Mr. Klein's letter, which attitude an observer would be certain is shared by the entire school staff . . .

"I am very proud of our new High School building which was constructed in 1939-40, and which was made possible by the vision of our Board of Education and the authorization of our taxpayers. Mr. Vignola, the Architect, did an excellent job in the design and layout of the building. This has been the fourth year of use of this building which from an educational point of view has been extremely functional. The upkeep of the building has been kept to a real minimum by the type of construction and the type of materials put into the building, which have been very serviceable."



Air view of the Central School, Goshen, New York, a large and exceptionally well-appointed school building of which the impressive wings are shown in a smaller picture below. Robert R. Graham, Architect.



Above, large Central School, Dundee, N. Y. Robert R. Graham, Architect. Below, Elementary School, Montpelier, Vermont, also designed by Robert R. Graham, Architect.

The four views, left to right, Fort Ann School, Fort Ann, N. Y. Carl W. Clark, A.I.A., Architect.

Close-up view of one wing, Central School, Goshen, N. Y. Robert R. Graham, Architect.

Night view, Junior-Senior High School, Harrison, N. Y. Robert P. Vignola, Architect.

Library and Reading Room, Central School, Goshen, N. Y. Robert R. Graham, Architect.



# A Modern Approach to SCHOOL Construction



Above, the modern, extremely functional Junior-Senior High School, Union Free School District No. 6, Harrison and Rye, N. Y. At left, main entrance of Harrison, N. Y., Junior-Senior High School, with extruded aluminum and glass marquee and impressively large extruded aluminum windows. (See night lighting effect in smaller picture below.) Architect, Robert P. Vignola, Harrison, N. Y.

For today's requirements and for the days to come when the need for Schools and other public buildings can be exactly met, the importance of a background of many fine schools successfully constructed is of vital importance.

The John A. Johnson Contracting Corp. has such a background, not only for Schools, and other public buildings, but also for the construction of complete cities and towns, water-works, sewerage systems and the related utilities and facilities.

*Literature will be mailed upon request*

ROBERT P. VIGNOLA, Architect  
Harrison, N. Y.  
(Junior-Senior High School)

I wish to take this opportunity, now that the Junior-Senior High School (Harrison, N. Y.) has been completed, of expressing my appreciation of the business-like way in which your firm carried thru this half million dollar project.

I can assure you that should I have another similar project, I sincerely hope that you may be the successful bidder and that I may have the opportunity of renewing the pleasant relations that have existed throughout the entire construction of this school.

(Signed) Robert P. Vignola

CARL W. CLARK, A.I.A., Architect  
Cortland, N. Y.  
(Fort Ann School, Fort Ann, N. Y.)

... Thruout the progress of the work, (at Fort Ann) your corporation was all that one could ask and the completed product is one of which the School authorities, the State authorities and this office are justly proud.

Our administration work was made easy due to the efficient office practices of your company.

(Signed) Carl W. Clark, A.I.A.

ROBERT R. GRAHAM, Architect  
Middletown, N. Y.  
(Goshen, N. Y., Dundee, N. Y., and Montpelier, Vt.)

The issuance of your final payment on the Goshen project brings to a conclusion 3 years of close association with you on the construction of 3 of my largest school buildings.

It seems appropriate now to thank you for your careful work and to congratulate you on your organization, your superintendence and ability to expedite your work.

It has been a pleasure to work with you, and I trust that we will soon have work which will be of interest to you.

(Signed) Robert R. Graham



"A Firm Foundation  
Since 1896"

Send for Brochure A 64



# TURNER CONSTRUCTION COMPANY

FOUNDED 1902

BOSTON

NEW YORK

PHILADELPHIA

## *Experience*

We offer experience gained in the construction of more than 2,000 buildings costing over \$660,000,000, completed during the past 42 years.

## *Organization*

Our 14 active officers average 30 years of service with our Company. We have more than 30 Superintendents who average 17 years' service with us. Our 125 active Foremen average 15 years' service. These men create dependable, efficient field organizations. They are supported by "inside" staffs of Purchasing Agents, Engineers, Expeditors and Accountants with similar service records.

Thus, both "line" and "staff" are widely experienced and thoroughly familiar with our methods.

## *Cost Control*

Every job is budgeted for time and cost. All labor and material items are classified. Actual costs are compared regularly with the budget and control of the cost of the work thereby maintained. The actual costs are

projected to indicate the final cost and methods adopted promptly to correct those out of line with the budget.

Our financial strength is a factor in securing the lowest prices in the purchase of materials and in the letting of subcontracts.

Owning and maintaining our own equipment makes for having the most economical plant layout for each job.

## *Performance*

More than 60% of our work represents *repeat* orders from satisfied clients.

The more than half a billion dollars of contracts we have secured were obtained about 40% in lump sum competition and 60% on cost plus a fee basis. Eliminating the work done in World Wars No. 1 and No. 2, about 50% of our business normally is secured in lump sum competitive bidding—the remainder as a result of selection on a fee basis—a well balanced and healthy relationship for any contractor—it tends to preserve his "Cost Consciousness".



MEN'S DORMITORY, ST. LAWRENCE UNIVERSITY, CANTON, N. Y.

Ernest Sibley—Architect

THIS DORMITORY PROVIDES ACCOMMODATIONS FOR 180 STUDENTS AND CONTAINS DINING ROOM, CAFETERIA, LIBRARY AND MUSEUM, OFFICES FOR STUDENTS' PUBLICATIONS, GAME ROOM AND A LARGE COMMON ROOM

THE AMERICAN SCHOOL AND UNIVERSITY—1944



## INSTITUTIONAL CLIENTS

## Schools — Colleges — Churches — Libraries — Museums

	Location	Architect or Engineer
Allbright Memorial Gymnasium (Western Electric Co.)	Chicago, Ill.	Mundie & Jensen
Julia Dyckman Andrus Memorial Brearley School	Yonkers, N. Y.	Milton H. McGuire
Boston University	New York, N. Y.	Benjamin W. Morris
Brown University	Boston, Mass.	Cram & Ferguson
Buffalo Academy of the Sacred Heart (Stella Niagara)	Providence, R. I.	Coolidge, Shepley, Bulfinch & Abbott
Bureau of Standards, U. S. Department of Commerce	Lewiston, N. Y.	Gavin Hadden
The Conventual Church and Monastery of St. Mary and St. John	Washington, D. C.	Paul P. Cret
Cornell University	Cambridge, Mass.	Chester Oakley
Delaware School Foundation	Ithaca, N. Y.	Donn & Deming
Drew University	Georgetown, Del.	Cram & Ferguson
Fitchburg High School	Madison, N. J.	Gavin Hadden
Friends' Academy	Fitchburg, Mass.	Brown & Whiteside
Girard College	Locust Valley, N. Y.	Charles Z. Klauder
	Philadelphia, Pa.	Coolidge, Shepley, Bulfinch & Abbott
		Frank H. Quinby
		Thomas Martin & Kirkpatrick
		Edward L. Tilton
		Alfred Morton Githens
		Allen & Collens
		Densmore, LeClear & Robbins
		Coolidge, Shepley, Bulfinch & Abbott
		Office of Hollis French
		Chester Oakley
		William H. Gompert
Harvard Congregational Society	Brookline, Mass.	Andrews, Jones, Biscoe & Whitmore
Harvard University	Cambridge, Mass.	Walker & Gillette
		Allen, Collens & Willis
		Day & Klauder
		Gavin Hadden
		Thomas, Martin & Kirkpatrick
		Stewardson & Page
		Robert R. McGoodwin
		Paul P. Cret
		W. S. Hindman, Chief Engineer
		Stone & Webster, Inc., Supervising Engineers
		William H. Gompert
Holy Name College	Washington, D. C.	Arthur H. Brockie
James Madison High School (New York City Board of Education)	Brooklyn, N. Y.	Ernest Sibley
The Masters School	Middletown, Del.	Ernest Sibley
New York Historical Society	Canton, N. Y.	George M. Cady, Associate
Old South Society in Boston	Van Hornesville, N. Y.	G. Morris Whiteside, II, and Victorine & Samuel Homsey
University of Pennsylvania	Philadelphia, Pa.	Martin & Jeffers
		Thomas, Martin & Kirkpatrick
University of Pittsburgh	Pittsburgh, Pa.	
Public School No. 210 (New York City Board of Education)	Brooklyn, N. Y.	
St. Andrew's School	Middletown, Del.	
St. Lawrence University	Canton, N. Y.	
Van Hornesville School	Van Hornesville, N. Y.	
The Wilmington Society of the Fine Arts	Wilmington, Del.	
Wilmington Technical High School	Wilmington, Del.	
Y.M.C.A.	Williamsport, Pa.	



THE CHARLES HAYDEN MEMORIAL, HOME OF THE BOSTON UNIVERSITY COLLEGE OF BUSINESS ADMINISTRATION, BOSTON, MASS.

Cram and Ferguson—Architects

Coolidge, Shepley, Bulfinch and Abbott—Associated Architects

THE AMERICAN SCHOOL AND UNIVERSITY—1944

# THE PHILIP CAREY MFG. COMPANY

Manufacturers of  
Roofing and Waterproofing Products, Heat Insulations  
Lockland, Cincinnati, Ohio

The roof of a school building represents little more than 1% of the total construction cost yet on its durability and weather-resisting qualities depend the protection of the other 99%. The school roof should be designed and built to last the life of the building. Re-roofing is an expense that need not be incurred under ordinary conditions if the right roof is selected and properly constructed.

Carey Roofs meet every requirement for modern school construction. For more than forty years Carey Roofs have been specified for important public buildings throughout the United States, and their application to new school construction is increasing year by year because they have proved their durability and lasting protection against weather.

The quality of materials entering into Carey Built-Up Specifications are carefully checked by our engineering department and research laboratory, allowing a liberal factor of safety as to tensile strength, number of plies and thickness of plies, to assure adequate and permanent weatherproof protection.

## FREE ROOF SURVEY

The Carey Roof Survey Plan has been in operation for several years and has been the means of cutting roofing upkeep expense to a minimum. Without obligation on your part, a Carey Inspector will make a careful survey of your roofs, flashings, parapets, etc., and give an honest and impartial report on their condition.

## SPECIFY

**Carey  
ROOFS**

**FOR LASTING  
PROTECTION**

**Carey Asfaltslate Shingles** represent the standard of quality in composition shingles. They are built especially rugged and substantial to give extra years of trouble free service. They are proof against all ordinary fire risks and need no paint or other upkeep expense.

**Careystone Asbestos Cement Shingles.** Made of asbestos and cement, they provide a permanent roof possessing natural properties that enable it to resist the destructive influences of time, weather and fire.

**Carey Heat Insulations.** For low pressure steam or hot water heating systems, Careycel Pipe Covering has no equal. It combines high insulating efficiency with low cost. The Carey Heat Insulation Line is complete. A special insulation material to meet every service condition. Temperature ranges from zero to 2500° F.

**Carey Rock Wool Building Insulation** provides greater comfort, lower cost of heating and when properly installed corrects condensation problems. Made of minerals, Carey Rock Wool will not char and is fire-resistant.

**Carey Waterproofing Materials.** Carey waterproofing for basement walls and swimming pools; Protective coatings to repair leaks and prolong the life of all types of roofs, protection paints for hot and cold metal surfaces.

Other Carey Products include Careystone Asbestos-Cement Wallboard and Sheathing, Asphalt Tile Floors and Expansion Joints.

## THE PHILIP CAREY MFG. COMPANY

*Dependable Products Since 1873*

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THE AMERICAN SCHOOL AND UNIVERSITY—1944

# AMERICAN WINDOW GLASS COMPANY

Manufacturers of Lustraglass, Plexite and Supratex Safety Glass; Lustrablu and Lustragold ornamental glass; Lustra Cover Glass for microscope slides, Armor-Lite Bullet-Resistant Glass; Crystal Sheet, Chipped and Special Glass for Scientific and industrial needs

Pittsburgh, Pennsylvania



School windows of **LUSTRAGLASS**  
*The Ultra-violet Ray Sheet Glass*  
 provide many exclusive advantages at no extra cost.

Windows and the glass we use in them are being recognized more than ever as playing a most important part in our daily life. Wherever there is indoor life and activity it is imperative that we let in all the natural daylight possible and that this light be undistorted. This is especially true in the school room where our growing children spend the greater part of each day.

As a result of the demand for more and better light, with less distortion, architects and builders everywhere are insisting on windows of Lustraglass and the many exclusive advantages it provides at no extra cost.

Compared with ordinary window glass, Lustraglass . . .

- transmits more of the ultra-violet rays of sunlight
- is obviously freer from distortion
- has much less of the greenish cast common to other glass used for glazing
- offers a jewel-like luster that enhances the appearance of any building
- and last, but not least, Lustraglass costs no more.

Write Lustraglass into your next specification—it has no equal. Booklet 4107 and Windowgraph Chart free.



HOLY NAME GRADE SCHOOL, TOPEKA, KANSAS Glazed throughout with Lustraglass • Architect: Ben H. Byrnes, Salina, Kansas  
 Contractor: J. H. Casson & Sons, Topeka, Kansas • Glazier: Curtis Companies Incorporated





# THE TEXAS COMPANY

Manufacturers of



## TEXACO ASPHALT SHINGLES and ROOFING

### FACTS ABOUT TEXACO ASPHALT ROOFING FOR SCHOOL AND UNIVERSITY USE

#### Lasting Economy

Texaco Asphalt Shingles and Roofing offer more advantages dollar for dollar than any other type of roofing.

#### Fire Underwriters' Approval

The Underwriters' Label is your assurance of protection against flying embers and sparks. This may permit reduction in insurance rates, subject to local fire conditions.

#### Protection Against the Weather

Asphalt is the oldest and most widely used weather- and water-proofing agent known to man.

#### Meets All Requirements

Texaco Asphalt Shingles and Roofing meet U. S. Army, Navy and other government specifications—meet or exceed structural specifications for educational buildings, both for new work and for re-roofing.

#### Attractive Appearance

Accepted patterns and pleasing colors make Texaco Asphalt Shingles and Roofing highly suitable for school and university use—blending with any architectural style.

#### Asphalt — Most Popular Type

Today asphalt is the most popular type of roofing in America. Economy, attractiveness and protection are the reasons for this preference over all other types of roofing.

#### Texaco Quality Well Known

Texaco Asphalt Shingles and Roofing maintain the standards of quality and dependability established by each of the more than 350 petroleum products of The Texas Company.

#### Convenient Source of Supply

The widespread distribution facilities of The Texas Company through the local Texaco Roofing Dealer assure prompt deliveries and helpful cooperation with all roofing problems.

• • •

FOR SAMPLES, COLORS AND SPECIFICATIONS SEE THE NEAREST TEXACO ROOFING DEALER OR WRITE TO THE NEAREST OFFICE OF THE TEXAS COMPANY OR TO THE TEXAS COMPANY, ROOFING SALES DIVISION, 135 E. 42ND ST., NEW YORK, 17, N. Y.



TEXACO—a name  
that millions know



TEXACO—a name  
you can trust

ONE OF MANY SCHOOL BUILDINGS ROOFED WITH TEXACO STRIP SHINGLES  
Texaco Asphalt Shingles add beauty and color and years of economical protection

### TEXACO ROOFING DEALERS EVERYWHERE East of the Rockies

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District Offices:

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Buffalo, N. Y.  
Chicago, Ill.

Dallas, Texas  
Denver, Colo.  
Houston, Texas

Indianapolis, Ind.  
Minneapolis, Minn.  
New Orleans, La.

New York, N. Y.  
Norfolk, Va.

THE AMERICAN SCHOOL AND UNIVERSITY—1944

# MICHAEL FLYNN MANUFACTURING CO.

(SUCCESSOR TO DAVID LUPTON'S SONS CO.)

E. Allegheny Ave. at Tulip St., Philadelphia 34, Pa.

Manufacturers of Metal Windows, Doors, Skylights, and Window Operating Devices

## LUPTON METAL WINDOWS

Lower Merion Senior High School  
(Technical Division, Ardmore, Pa.)

Savery Sheetz & Gilmour, Architects  
Joseph P. Farrell, Builder

### *More light—with Lupton . . .*

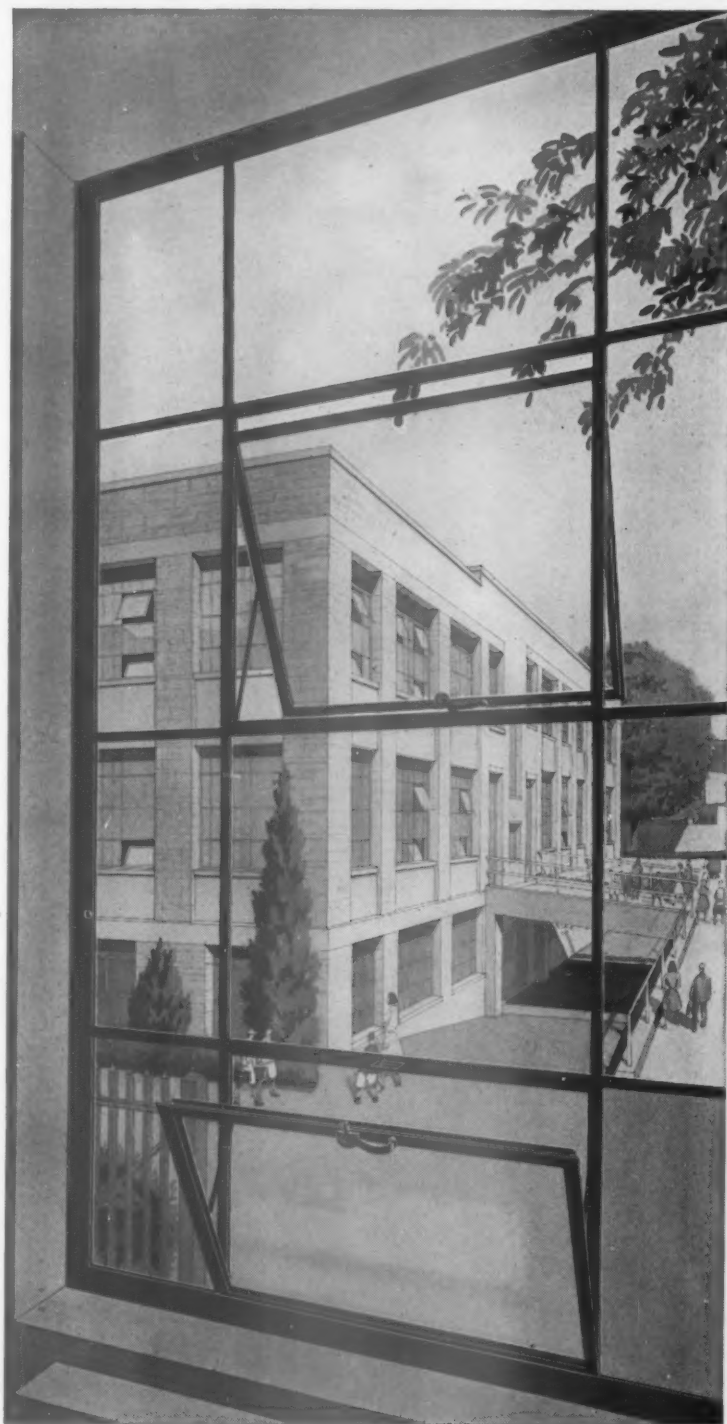
Extensive research and careful planning have led to increased daylight requirements for schools . . . and Lupton Windows are designed to meet these requirements.

Lupton Metal Windows mean not only more light, but easily controlled ventilation, smooth operation, extreme weather-tightness and low first cost and maintenance.

Let Lupton help you plan now. Over forty years' experience in metal window construction. See our Catalog in Sweet's, or write for free copy.



MICHAEL FLYNN MANUFACTURING CO.



THE AMERICAN SCHOOL AND UNIVERSITY—1944

# JOHN E. LINGO & SON, INC.

Established 1897

Manufacturers of  
Metal Flagpoles

Telephone: Camden 487

29th Street & Buren Avenue  
Camden, New Jersey

## TWO DISTINCT TYPES OF STEEL FLAGPOLES

### CONTINUOUS STRAIGHT TAPERED FLAGPOLES

Continuous Straight Tapered flagpoles are made of new high grade open hearth steel, have a smooth uninterrupted exterior surface throughout without visible joints and offsets, and resemble a wooden flagpole in appearance. They are standardized in lengths from 20

ft. to 200 ft. These poles are carried in stock and prompt shipments can be made.

Continuous Straight Tapered flagpoles are ideal as replacements of wooden flagpoles, for not only is the appearance the same but the steel pole affords lightning protection, unlimited life and dependability, not usually found in wooden flagpoles.

### SWAGED SECTIONAL FLAGPOLES

Swaged Sectional flagpoles are fabricated in sections of new full weight copper bearing steel pipe with hydraulic die-swaged, telescoped and shrunk joints, made without the use of bolts, rivets, pins, screw couplings or lead calking. They are standardized in lengths from 15 ft. to 200 ft. These poles are carried in stock and immediate shipment can be made.

### CATALOGUES AND SERVICE

60-page general catalogue and descriptive pamphlets giving full information, details, specifications, prices, etc., promptly mailed on application. Our Engineering Department will gladly assist you in planning your flagpole installations most satisfactorily and economically, without obligation on your part whatsoever.

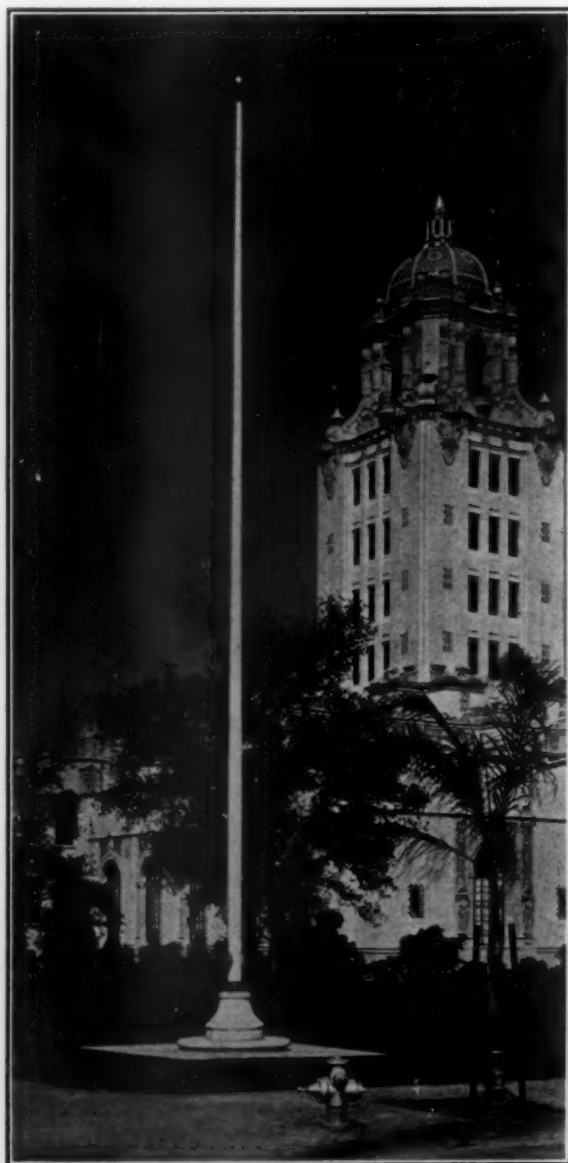
### FACILITIES

John E. Lingo & Son, Inc., is noted for its ability to produce metal flagpoles promptly, regardless of height, diameter, or quantity. Our large stock of material, and extensive plant facilities usually enables us to ship flagpoles quicker than any other similar establishment. However, by pledging full cooperation to the United States Government for the Duration our facilities are converted to work on war products. Lingo Metal Flagpoles will be quickly obtainable in new modern designs when Government regulations again allow unrestricted manufacturing of metal flagpoles.

### QUALITY OF PRODUCTS

NEW MATERIAL EXCLUSIVELY IS USED IN THE MANUFACTURE OF "LINGO" FLAGPOLES. You are guaranteed that our pipe and tubing is new, full weight and mill tested. Affidavits and mill certificates attesting to the use of new material gladly furnished if desired. We do not use second-hand, untested, mill rejected, rerolled or light weight material. Red lead and other nontransparent primers serve as an ideal medium for hiding inferior materials and construction, so "LINGO" flagpoles are painted a shop coat of non-rust transparent varnish which permits immediate and positive inspection of the material and construction used. Your selection of a "LINGO" flagpole assures a high quality product, designed by pioneer flagpole manufacturers and constructed by competent mechanics.

Inspection of Your Present Flagpoles Now May Save Lives Later!



50 Feet Above Grade, Continuous Straight Tapered Heavy Type Steel Flagpole, City Hall, Beverly Hills, Calif.



# TRAFFIC & STREET SIGN COMPANY

Flag Poles Made of Steel, Copper-Bearing Steel, Stainless Steel,  
Bronze and Aluminum

78 Foundry Street  
Newark, N. J.

## CO-OPERATION WITH ARCHITECTS AND SCHOOL OFFICIALS

Due to our many years of experience in handling floodlight, sign, radio and flag pole problems of all kinds, we are able to offer architects, contractors and building owners a well rounded service in planning, detailing and specifying the flag pole and equipment best suited to each individual installation, location factor, and budget limitation.

We have an unusually wide selection of stock bases, and shall be glad to forward sketches of them. Complete catalogue will be sent on request.

We are also equipped to fabricate special bases in accordance with architects' sketches.

We suggest that rough sketches of contemplated flagpoles be submitted to us—in order that we may prepare details, specifications and estimates of complete costs. All services offered by **Traffic & Street Sign Co.** are, of course, without charge or obligation.

**We likewise are able to recommend the maximum length and number of sections that assure the most economical freight rate to any part of the country.**

## CONTINUOUS TAPERED FLAG POLES

Continuous tapered flag poles are manufactured in two types: **Continuous straight taper**, and **Continuous entasis taper**. Straight tapered poles for roof and ground setting in copper-bearing steel are carried in stock up to 80 feet, and have a standard taper of approximately 1 inch in 7 feet. Quick delivery can be made on entasis taper, special taper, and standard taper poles up to 200 feet.

## TELESCOPED SECTIONAL FLAG POLES

Telescoped sectional flag poles are manufactured in three types: **standard**, **heavy**, and **extra heavy**. Stock sizes in copper-bearing steel furnished in lengths up to 100 feet in both roof and ground-set poles. Quick delivery can be made on poles up to 200 feet. All the joints are die swaged and shrunk.

## SAFETY NOTE

Architects working on new school buildings as well as all educational purchasing officials are urged to investigate the advantages for safety of steel as opposed to wood in flag pole construction. Wood poles which to all outward appearances are in good condition may have rotted inside to a point where they are early victims of the next strong blow. Furthermore, a good steel flag pole close to a building is excellent protection against lightning. Steel poles not only

safeguard adjacent structures but can also be struck by a bolt without danger of collapse.

## THE NEW "CADET" FLAG POLE

To meet the growing demand for a continuous tapered flag pole of light weight and at a cost within the reach of every school budget, **Traffic & Street Sign Co.** offers the "Cadet." This new flag pole has the same construction and proportioning, the same uninterrupted surface as our standard continuous straight tapered poles—but is reduced in height to 40 feet or less. (This permits a reduction in wall thickness and in weight.) It is built strong and safe—for trouble-free service under all conditions. It is guaranteed to withstand a wind pressure of 90 miles per hour. Its newly designed halyard truck assures satisfactory operation at all times. It can be ground set (with or without base); roof set (with braces or penetrating roof); or wall set (with a wide variety of supports). It can also be used as a light-weight outrigger pole.



Bloomfield Junior High School  
Bloomfield, N. J.

Stocked in four sizes for immediate delivery at surprisingly moderate cost.

## OTHER PRODUCTS

"Slow," "Caution," "School Zone" signs, Parking Regulation signs, Posts and Standards for all type signs, Radio poles, Floodlighting Poles, etc.

(For further detailed information refer to Sweet's Catalog)

THE AMERICAN SCHOOL AND UNIVERSITY—1944

# FREDERIC BLANK & COMPANY, INC.

New York Central Building, 230 Park Avenue, New York, N. Y.

Sun Fast

**Fabron**  
REG. U. S. PAT. OFF.

Washable

*The Fabric Wall and Ceiling Covering for School Interiors*  
**Economical — Attractive — Efficient**

## What Is Fabron?

**Fabron** is a specially-treated fabric devised for the correct finishing of interior walls and ceilings of schools and institutions. It is totally different from any other wall covering. It incorporates structural, decorative, practical and economical advantages resulting from years of laboratory research plus practical world-wide experience in wall covering installations under widely-contrasting conditions.

## Exclusive Characteristics

**Fabron** has a sturdy canvas foundation with a plastic body on which fine lacquer paints—specially compounded—have been fused into a structural unit to make its surface resist light and withstand maximum wear for all-around usage. Its exclusive formula, i.e., its "physical" composition; its resilience; its "glove" feel; its appearance; the service it renders, is not only different but self-apparent.

● **WHAT EFFECT DOES IT OFFER?** It is produced in a range of solid colors, functional textures, and decorative patterns, answering the needs of schools and institutions.

● **HOW DOES IT COME?** In convenient double rolls measuring 27" wide by 33 1/4' long—a finished surface ready for use. It is applied in the same manner and as easily as good wall paper.

● **WHERE IS IT USED?** Its features commend it for the interior of schools. **Fabron's** Institutional Collection of colors, textures and patterns include correct selections for widely-different use:—Auditoriums, Classrooms, Corridors, Dormitories, Lobbies, Offices, Public Rooms, etc.

● **WHAT ARE ITS ADVANTAGES?** It combines structural, practical, decorative, and economical advantages, and provides decoration in a permanent form, architecturally correct.

● **COST:** Its initial cost need not be any higher than good paint or good wall paper.

● **ECONOMY:** Its permanency eliminates the expenditures and inconvenience of periodic re-decoration. "Its cost to use" makes it a most economical wall finish.

● **PLASTER PROTECTION:** Its canvas base protects the wall and prevents plaster cracks. After 10 years or more when it has outlived its decorative purpose it still continues to serve for years to

come as it offers an ideal base for subsequent paint or other wall treatment.

● **WASHABILITY and UPKEEP:** The simplest and easiest. Can be washed with water, a soft cloth or sponge, and a neutral soap, as often as necessary even by inexperienced help.

● **FADELESSNESS:** Its sunfast colors are an insurance against interiors going stale; this also permits practical and invisible patching.

● **SANITATION:** Can be disinfected with antiseptic solutions commonly used in hospitals for such purpose without affecting its colors.

● **CONVENIENCE:** Can be installed in a fraction of the time required for painting without the inconvenience of offensive odors.

● **APPEARANCE:** **FABRON** "dresses" the wall and gives it a veneer of quality that is immediately apparent. Permits the superintendent to predetermine desired effects and insures the correctness of his entire composition.

● **SERVICE:** The technical and practical experience of our School Advisory Staff is at your service to answer questions and assist in solving your problems. **Color Schemes, Cost Estimates, WITHOUT CHARGE.** Write for Details.

● **PROOF:** **FABRON'S** merits are based on past performances. Installations in universities, colleges, schools. Large users' references furnished on request.

## Fabron Epitomizes the Modern Method of Finishing Walls and Ceilings

**Fabron**, while it decorates, preserves that decoration through maximum wear and resistance to scuffing. It prevents the appearance of dirt-collecting, disease-breeding plaster cracks. Its easily cleaned surface protects pupil health. **Fabron** is the scientific solution of problems pertaining to decoration, cost and maintenance of interior walls and ceilings.

**FABRON Is Washable — Sun Fast**



**STUDY THESE SAMPLES OF FABRON**  
*Experiment with Them*

*They are not submitted as a decorative suggestion but only to acquaint you with the nature and the quality of the product itself.*

***FABRON'S** exclusive formula, i.e., its "physical" composition; its resilience; its "glove" feel; its appearance; the service it renders, is not only different but self-apparent.*

**FABRON Is Not an Oilcloth**



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## Facts About FABRON Fabric Wall and Ceiling Covering

1. **Cracked walls or falling plaster** are a constant problem. Fabron's sturdy canvas base gives permanent structural protection to plaster; prevents appearance of cracks; binds and strengthens weakened or patched plaster, and so adds to the life of the wall surface.

2. **When plaster repairs must be made.** Fabron strips can be lifted clean from the wall area and re-applied when repairs are completed. **Fabron saves redecorating costs.**

3. **You may be troubled with peeling paint.** By a simple, economical preparation of such surfaces, you can apply Fabron and eliminate such defects. **Fabron is non-peeling, non-scaling.**

4. **School walls are marred with scuffs and scratches.**

Fabron's resilient surface withstands ordinary impacts of furniture and equipment—they do not break easily through its tough canvas surface.

5. **Your school walls should be cleanable, disinfectable** if necessary, without injury to their appearance. **Fabron's lacquer colours are Sun Fast and Washable.** They can be restored to their original freshness with water, soap and soft cloth or sponge. Ink, pencil marks, etc.—can be removed without injuring Fabron's surface by applying proper dissolvent.

### DECORATIVE ADVANTAGES

#### A. Eye-Appeal

Colour in schools is a dynamic tool—either stimulating or depressing; a harmonizing or disturbing influence. Dull, drab, irritating colours can create detrimental conditions.

**Fabron's special School Collection** simplifies the selection of pleasing colours and textures that create the distinctive appearance school interiors require.

B. **Fabron eliminates guesswork in determining colour schemes.** With Fabron you know in advance what the effect will be. No experimental mixing of colours—no misunderstandings—no disappointments. You are assured of getting exactly what you order, without adulteration or substitution.

### PRACTICAL ADVANTAGES

#### Fabron is easy to apply

1. A paperhanger of average skill can make a satisfactory installation.

2. Fabron is lacquer paint scientifically applied by laboratory methods to sturdy canvas and comes in rolls, ready for use.

**Fabron offers a durable, permanent base for subsequent paint or other treatment.**

Fabron seals the pores of the walls and, being non-porous, offers an ideal base for future decorations when desired.

Its durability makes redecoration a choice, not a "must."

### Check Your Cost Sheets! Compare! "Investigate Before You Invest"

Over a 5-year period, do you know your total expenditures for wall and ceiling treatments; what paint and re-painting cost you in materials and labor? **The amount spent—a recurrent budget drain—will astonish you.** The initial cost of Fabron is a fraction of this total sum. Fabron can eliminate the bulk of this periodic drain, dispose of your decorat-

ing problems for years to come. Fabron renders many years of service, saving costs of re-painting. Figured on an actual per year service cost basis, Fabron is the most economical wall and ceiling treatment obtainable. On new walls, the initial investment for Fabron is not necessarily higher than that for good school paint.

### We Invite You to Consult Our School Advisory Department

With our compliments, it will submit for your consideration tested colours and textures styled for successful school interiors; **finished samples that you can visualize before their use**—Fabron samples of surfaces that are correct for the purpose and that can be duplicated by identification number. Our School Advisory Staff is at your service to answer questions and assist in solving problems.

COLOUR SCHEMES, COST ESTIMATES AND EXPERT ADVICE ARE SUBMITTED COST-FREE FOR YOUR CONSIDERATION

### MAY WE SUGGEST YOU INSTALL A TRIAL ROOM?

THE AMERICAN SCHOOL AND UNIVERSITY—1944



# THE CELOTEX CORPORATION

120 S. LaSalle Street  
Chicago, Illinois

*"It Ain't the 'Eavy 'Aulin'  
That 'Urts the 'Orses' 'Oofs . . .  
IT'S THE 'AMMER, 'AMMER, 'AMMER  
ON THE 'ARD 'IGHWAY!"*



IT ISN'T the heavier schedules and classwork alone that cause undue nerve strain in schools today. It's also the "hammer, hammer, hammer" of a thousand and one noises, resulting from overcrowding, concentrated into a day-long din.

Leading schools everywhere have taken steps to correct similar situations. They have given overworked staffs and students the quiet blessings of Sound Conditioning with Acousti-Celotex. It soaks up distracting noise, thus easing nerve tension. It enables students to hear every word from wherever they sit. Helps teachers work calmly and efficiently under trying wartime conditions.

Acousti-Celotex is America's most widely used sound conditioning material. It can be quickly and quietly applied, can be repeatedly painted. The quieting results are amazing. You can prove it yourself by starting with a classroom, corridor or any other noise source in your school. Talk over your problem with the Acousti-Celotex distributor in your territory. He is headquarters for sound conditioning and a member of the world's most experienced organization. His advice is yours without obligation and **he guarantees results.** If you do not know his name, a note to us will bring him to your desk.

*Sound Conditioning with*  
**ACOUSTI-CELOTEX**  
PERFORATED FIBRE TILE—SINCE 1923 REG. U. S. PAT. OFF.

Sold by Acousti-Celotex Distributors Everywhere  
In Canada: Dominion Sound Equipments, Ltd

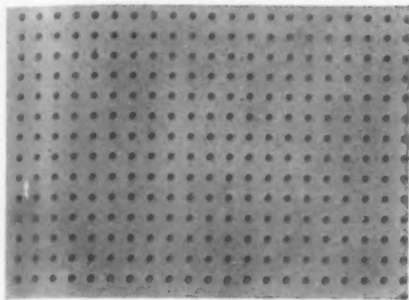


★ ★ ★  
Send for this **FREE** booklet. Get your copy of this informative booklet, "25 Answers to Questions on Celotex Sound Conditioning." You can read it in 8 minutes.

THE CELOTEX CORPORATION, Dept. 44  
Chicago, Illinois

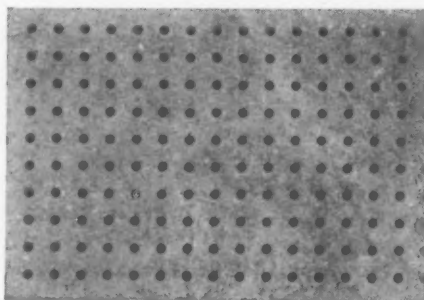
THE AMERICAN SCHOOL AND UNIVERSITY—1944

## CELOTEX ACOUSTICAL PRODUCTS



### **ACOUSTI-CELOTEX**

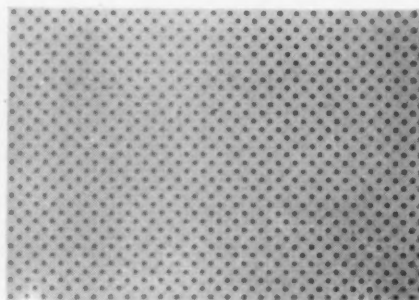
ACOUSTI-CELOTEX (cane or mineral) acoustical tile possesses perforations of controlled diameter, depth and spacing, insuring uniform performance and practical paintability without loss of absorption



### **ACOUSTI-CELOTEX**

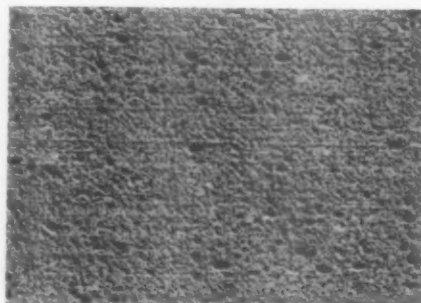
#### **PERFORATED PANEL BOARD**

PERFORATED PANEL BOARD FACING is used over sound-absorbing elements which may be varied as required for different parts of a room



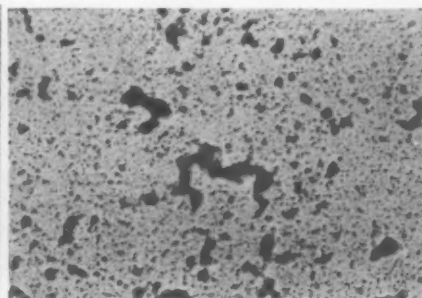
### **ACOUSTEEL-B**

ACOUSTEEL is paintable, perforated steel tile enclosing a sound-absorbing element of incombustible mineral fibre



### **MUFFLETONE — Standard**

MUFFLETONE is the name of our precast, porous gypsum tile, available in a variety of integrally mixed, beautiful pastel colors



### **MUFFLETONE — Fissured**



### **Q-T DUCTLINER**

Q-T DUCTLINER is an acoustical material designed to absorb noise in air conditioning ducts. Made of mineral wool and a special binder in rigid block form, it will not smolder or support combustion

## WHEN LIGHT REFLECTION IS IMPORTANT, BE SURE YOU CAN PAINT THE ACOUSTICAL MATERIAL YOU BUY



Painted Acousti-Celotex may be washed and cleaned to renew light reflection values until painting is necessary. Note how holes are always kept clear of paint, thus assuring constant and permanent maintenance of original sound-absorbing properties

THE AMERICAN SCHOOL AND UNIVERSITY—1944

# JOHNS-MANVILLE

22 East 40th St., New York 16, N. Y.



OFFICES IN ALL LARGE CITIES



The Hall of Music, Purdue University, is one of many examples of the use of J-M Sound Control by leading institutions of learning to provide proper hearing conditions in auditoriums.

## J-M SOUND CONTROL FOR SCHOOLS AND UNIVERSITIES

To school authorities faced with a problem involving control of sound, Johns-Manville offers the fruits of long practical experience and a background of more than 30 years of scientific study and research. From the J-M Acoustical Research Laboratories have come many of the developments which have today made it possible to provide a practical, economical solution to any type of sound control problem.

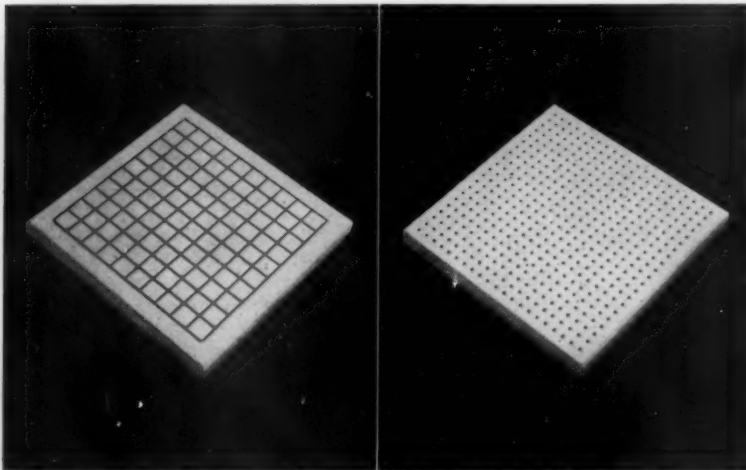
J-M Sound Control consists of three essential services:

**NOISE QUIETING**—Reducing the noise level in classrooms, cafeterias, corridors and other locations through the application of J-M Sound Control Materials which "soak up" undesirable noise much as a blotter soaks up ink.

**ACOUSTICAL CORRECTION**—Eliminating faulty acoustics in school auditoriums, lecture halls, etc.

**SOUND ISOLATION**—Isolating sounds originating in gymnasiums, manual training rooms, etc., and thus preventing their reaching other areas where quiet is essential.

**FIBRETEX AND FIBRETONE UNITS**—Johns-Manville has two new acoustical products—Fibretext and Fibretone. These units meet the demand for an economical and efficient material that can be easily applied. Fibretext Units are grooved 1" on centers in both directions,  $\frac{3}{32}$ " in width and  $\frac{5}{8}$ " deep. Fibretone Units have  $\frac{3}{8}$ " deep perforations in a pleasing pattern. The Border Units are the same basic material but without grooves or perforations. If desired, Fibretext and Fibretone can be painted and repainted with either brush or spray without a reduction in sound absorbing efficiency. For further details write for a copy of Sound Control Brochure AC-26A.



J-M Fibretext and Fibretone Units are 12" x 12" x 13/16" thick, made from selected clean pine fibres, pre-finished at the factory with two coats of white paint.



A J-M Acoustical Ceiling eliminates disturbing "corridor clamor" at St. Patrick's School, Menasha, Wisc.

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## J-M ASPHALT TILE FLOORING



This dining hall floor illustrates one of many attractive patterns possible with J-M Asphalt Tile. And this versatile flooring is as serviceable as it is beautiful!

As a decorative resilient flooring of low first cost, exceptional durability and extremely low maintenance, Johns-Manville Asphalt Tile has found widespread acceptance with school and university officials. Many millions of square feet are in use in classrooms, corridors, gymnasiums and other locations where economy and serviceability are important.

The raw materials used in J-M Asphalt Tile are mined, processed and refined under standards that are rigidly controlled to insure a uniformly high-quality product. Selected asbestos fibres from Johns-Manville's own asbestos mines are the largest single ingredient. These, with the moisture resistant asphalt and inert mineral fillers which are added to increase density, are combined to form a floor covering that cannot rot, is highly resistant to moisture, resilient, com-



Highly wear-resistant, easy to maintain, yet resilient and comfortable to walk on, J-M Asphalt Tile is an excellent flooring for the heavy traffic in school corridors

fortable to walk on, sanitary, and because of its high resistance to abrasion, gives many years of service with little attention for maintenance.

J-M Asphalt Tile is available in an extensive selection of both plain and marbled colors and a wide range of sizes, permitting literally hundreds of interesting floor patterns. Made in precision-cut units, the tiles are quickly and economically laid over any suitable sub-floor. All units are now pre-waxed at the factory, providing a finished floor which requires no waxing or polishing before it is ready for service and protecting the floor from possible rough usage in connection with other construction activities.

For further information, see Sweet's Architectural catalog or write for full-color Brochure FL-20A.

## J-M ASBESTOS BUILT-UP ROOFS

As pioneers in the roofing field and manufacturers of a complete line of built-up roofing products, Johns-Manville recommends the Smooth-Surfaced Asbestos Built-Up Roof as the most satisfactory for school service from the double standpoint of economy and fire-protection.

The asbestos felt as used in the J-M Smooth-Surfaced Roof does not support combustion and therefore provides a marked superiority in fire-resistance over the ordinary roofing felt. The protection offered by the smooth-surfaced asbestos roof against roof-communicated fires has been demonstrated many times in actual service.

Furthermore, since asbestos has the durability of stone, long exposure to sun, rain and weather has little effect on these roofs. Rot-proof, they need no periodic coating with slag or gravel. Maintenance costs are correspondingly low. Many Johns-Manville Smooth-Surfaced Asbestos Roofs that were applied 25 and 30 years ago are still giving service with little or no upkeep, testifying to the outstanding economy of this type of built-up roof.

Further details and specifications furnished on request.



Bonded for 10 years—still going strong after 25 years of service! That's the record of the J-M Asbestos Built-Up Roof on the Poly Prep Country Day School, Brooklyn, N. Y. It is typical of the service provided by these better built-up roofs

# WOOD CONVERSION COMPANY

Manufacturers of NU-WOOD Interior Finish . . .  
and BALSAM-WOOL Sealed Insulation  
St. Paul, Minnesota



## Balsam-Wool Attic Insulation

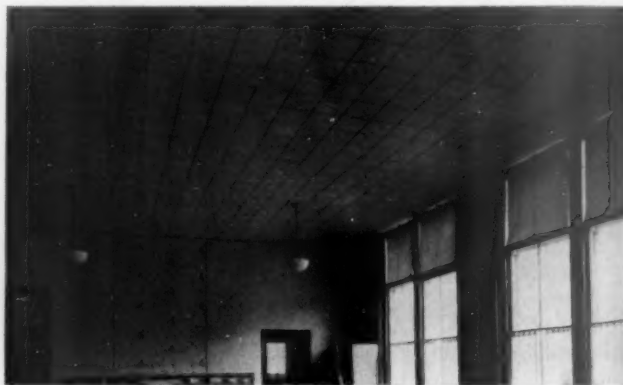
It is not only patriotic but practical to insulate the school attic first for fuel savings, and secondly for greater comfort winter and summer. Balsam-Wool, the original Sealed Blanket Insulation, is ideal for schools, as it combines the following qualities which assure lasting efficiency.

- 1. FUEL SAVINGS.** Balsam-Wool is highly efficient—the oldest and best known sealed insulation on the market. Depending on the type of structure in which it is installed, fuel savings as high as 20% may be obtained with it. Balsam-Wool soon pays for itself.
- 2. YEAR-ROUND COMFORT.** Balsam-Wool not only helps keep schools warmer in winter, with less fuel consumption, but also prevents heat penetration in summer, keeping rooms cooler during the hot months. It is available in three thicknesses—Standard—Double Thick—and Wall Thick—to suit every insulating need and condition.
- 3. PERMANENT.** Balsam-Wool is a lasting insulation because it is designed to meet every condition of use. It is completely sealed in an asphalt saturated kraft covering—providing double moisture protection. It has double wind barriers to prevent wind infiltration. It is fire resistant and termite-resistant. Its method of application allows important air spaces, which provide additional insulating value.
- 4. EASY APPLICATION.** Balsam-Wool is quickly and easily applied. The insulating mat is fastened securely to both liners—liners are fastened securely to framing members. Balsam-Wool cannot settle or pack—will not leave uninsulated spaces. Once applied, Balsam-Wool is a lifetime investment in fuel savings and comfort.
- 5. MONEY-BACK GUARANTEE.** Balsam-Wool Attic Insulation is sold under a money-back guarantee of complete satisfaction—complete assurance that if you are not completely satisfied with your fuel savings and increased summer comfort after a year of use, your money will be refunded, including cost of application.



## Nu-Wood (Kolorfast and Sta-Lite) Insulating Interior Finish

Nu-Wood Interior Finish is a wall and ceiling covering for all types of schoolrooms. It is available in many sizes, shapes and colors, making possible unlimited design and color combinations. Nu-Wood builds beautiful pre-decorated interiors, provides additional insulation against heat and cold, improves acoustics and reduces noise. Available in tile, plank, board and wainscot, Nu-Wood units are designed to fit together mechanically and harmoniously, the complete job having the following qualities:



- 1. TEXTURE AND COLOR.** A unique textured surface in a variety of fadeproof, harmonious colors which gives walls and ceilings a rich, velvety appearance. A matte surface which reflects light without glare or "Hot Spots."
  - 2. A NEW, EXCLUSIVE JOINT.** The tongue and groove eliminates breathing—improves insulation value. The shallow bevel reduces the shadow line in keeping with today's interior decoration technique.
  - 3. INVISIBLE NAILING** made possible by the new Nu-Wood Clip System.
  - 4. THERMAL INSULATION.** Nu-Wood brings added insulation to the school buildings, helping further to reduce fuel bills in winter and providing greater coolness in summer. Thermal conductivity .324.
  - 5. NOISE ABSORPTION VALUE.** Nu-Wood absorbs sound, quiets noise, improves hearing.
  - 6. EASY APPLICATION.** Nu-Wood can be applied directly over cracked plaster or other disfigured walls. Equally adaptable to new or old construction. It requires no maintenance, may be cleaned with a rubber sponge.
  - 7. LOW COST.** With these advantages—decoration, acoustical treatment and insulation—Nu-Wood is surprisingly low in cost.
- KOLOR-TRIM MOLDINGS.** The decorative wood molding especially designed to harmonize with the various Nu-Wood shades.
- NU-WOOD STA-LITE.** A light reflective form of Nu-Wood, with a light reflection of 76%. Sta-Lite has the unusual faculty of actually becoming lighter with use.

FURTHER INFORMATION ABOUT BALSAM-WOOL ATTIC INSULATION AND NUWOOD INSULATING INTERIOR FINISH WILL BE FURNISHED ON REQUEST

THE AMERICAN SCHOOL AND UNIVERSITY—1944

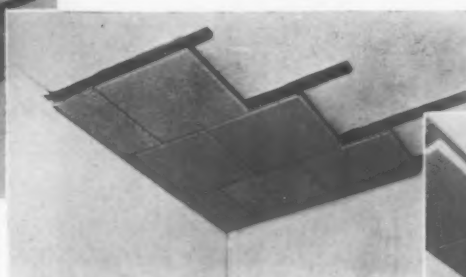
# THE LOXIT COMPANY

605 W. Washington Blvd., Chicago, Illinois

## LOXIT ACOUSTICAL SUSPENSION SYSTEMS



**Type 1-A**  
Straight edge tiles laid with matched joints using Loxit channels and double wing clips



**Type 1-B**  
Straight edge tiles laid with staggered joints using Loxit channel and single wing acoustical clip



**Type 1-N**  
Straight edge tiles laid on wood furring strips with staggered joints using Loxit wood furring clips

*Note on wall, double wing wood furring clip for matched joints*

**Type 1-M**

### TYPES OF LOXIT ACOUSTICAL SUSPENSION SYSTEMS

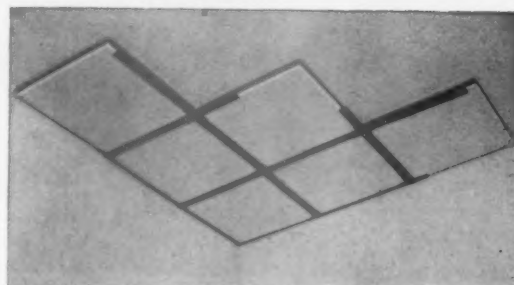
If you have an acoustical tile suspension problem you will find the solution in one or a combination of the Loxit suspension methods available for use with straight edged or kerfed tiles and slabs, applied directly to ceilings, walls, beams, ducts, etc., or suspended. There are three types of Loxit acoustical systems.

**TYPE 1**—Straight edged tile systems.

**TYPE 2**—Kerfed tile systems.

**TYPE 3**—Surface applied systems.

**ACOUSTICAL TILE AND SLABS**—The Loxit Company is not directly or indirectly interested in any type, make, brand, or manufacture of acoustical tiles or slabs. Loxit applies only to the mechanical method of erecting acoustical materials and can be used with any and all materials on the market choosing the type of suspension that is adaptable to the material, taking into consideration whether it is kerfed or straight edged.



**Type 3**

This system is a "life saver" where acoustical tiles and slabs have become loose and must be re-set. Available for all sizes of materials; also in other designs

**VERSATILITY OF THE LOXIT SYSTEM**—In no other system can the architect or acoustical contractor find the solution to all of their acoustical problems when using tiles and slabs kerfed or straight edged with matched or staggered joints applied directly to wall surfaces and ceilings or suspended.

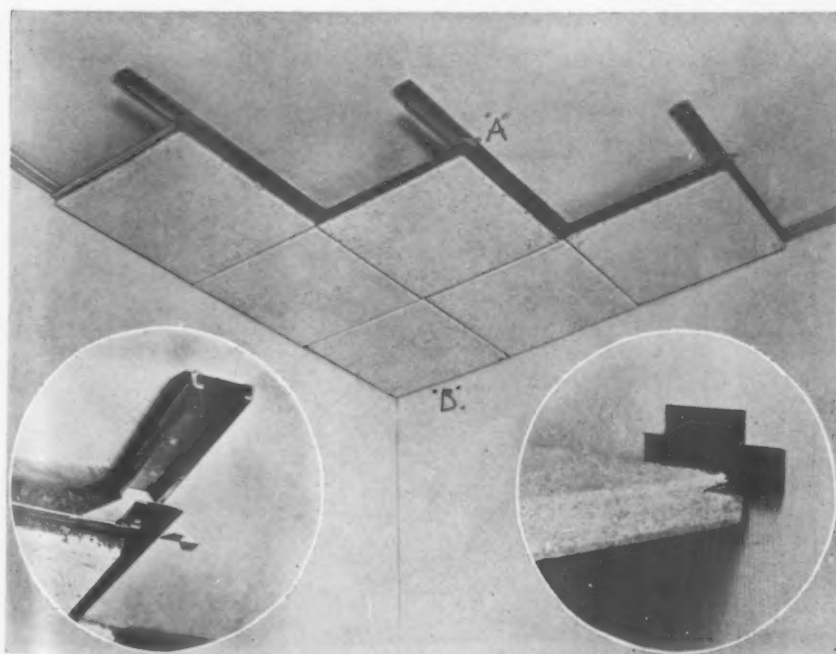
We do not know of an acoustical tile and slab condition that cannot be solved with the Loxit system.

**MECHANICAL SUSPENSION OFTEN REQUIRED**—Almost all government specifications specify that acoustical tiles and slabs shall be mechanically suspended.

More and more, architects designing private jobs are also requiring mechanical suspension because this is their guarantee that acoustical tiles and slabs will "stay put."

**Type 3**—A unique system composed of Loxit V strips, crosses, tees, and ells, specially designed to re-set acoustical tiles and slabs in existing installations that have become loose or for the setting of tiles and slabs directly to ceilings and walls by the use of a surface setting method which forms a wall or ceiling pattern at the same time acts as a positive breathing stop. Particularly adaptable to plastered ceilings.

In using this system acoustical tiles and slabs not originally mechanically suspended become permanently fixed in place providing against any further movement or breathing.



**Detail at "A"**

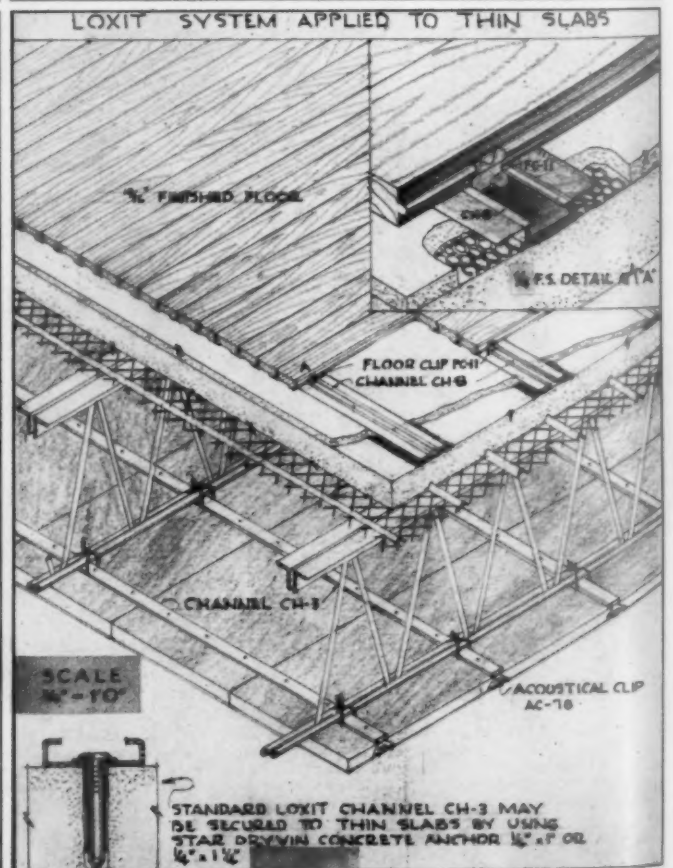
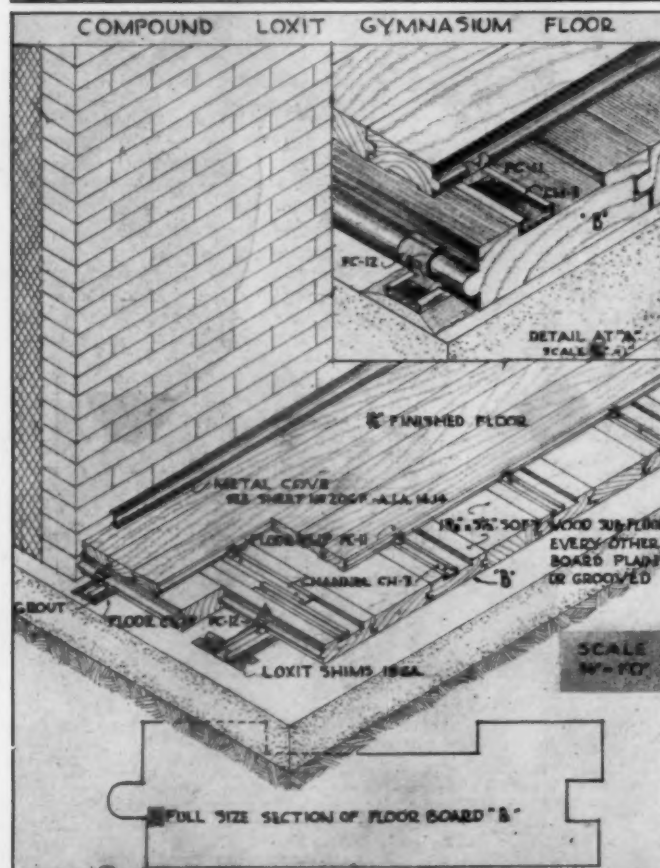
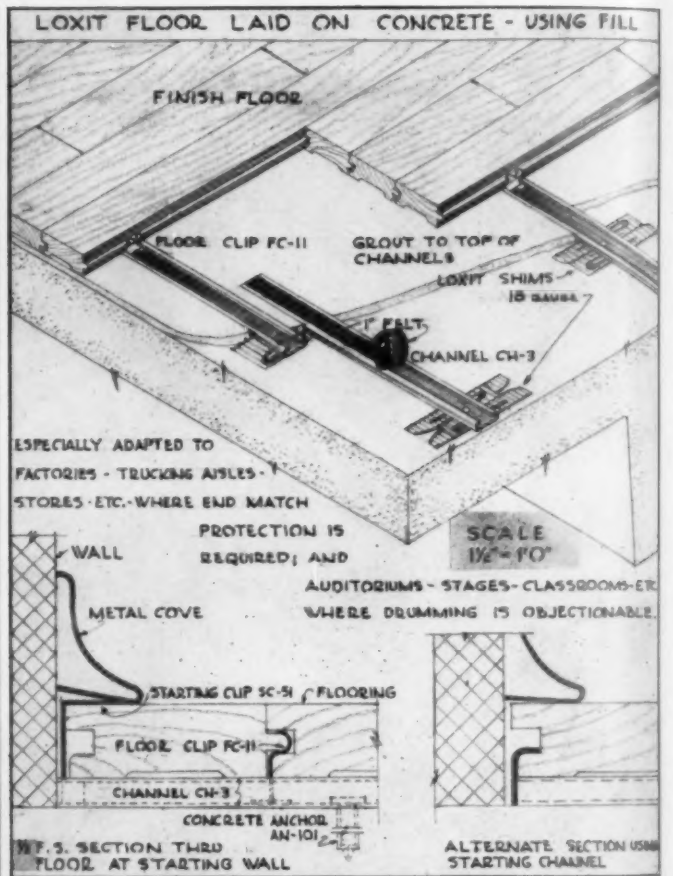
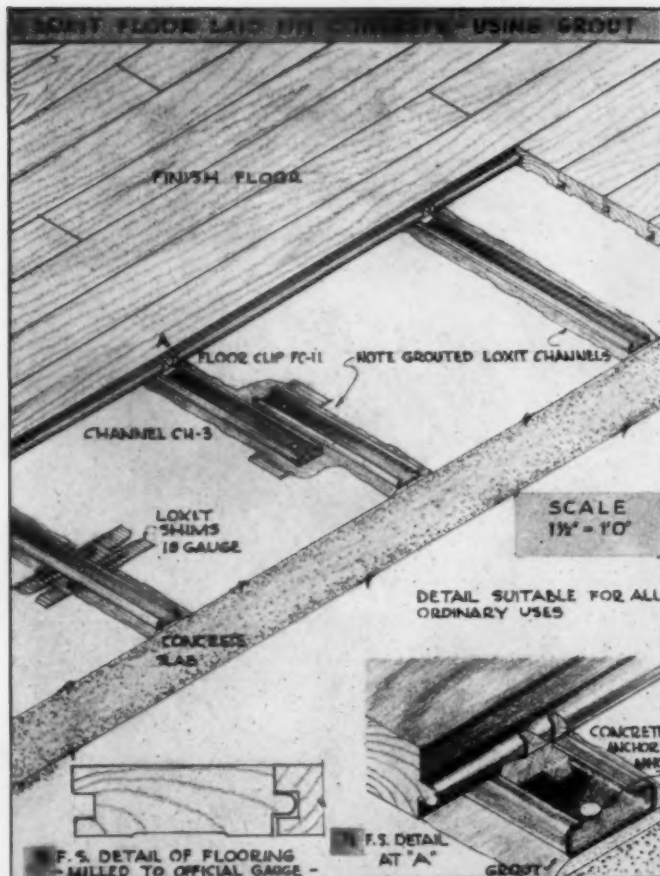
**Type 2**

**Detail at "B"**

**Kerfed tile suspension method. Entirely ceiling locked together at all points**  
**Type 2**—Kerfed Tile System using Loxit channels, hemmed runners and splines for setting kerfed acoustical tiles and slabs, the splines and runners serving as breathing stops as well as suspension members. This system is complete with wall angle runners and corner clips for the mechanical erection of the border and corner tiles.



## DETAILS OF LOXIT WOOD FLOOR CLIP SYSTEMS



## THE LOXIT FLOOR LAYING SYSTEM

For Standard T&G Wood Floors—Eliminates Nails, Wood Sleepers, Mastic

**A PROVEN, ECONOMICAL SYSTEM FOR ALL TYPES OF BUILDINGS**—The Loxit system is a simple mechanical method for laying ordinary strip wood flooring without nails, wood sleepers, or adhesives. It consists of:

- (a) A metal channel  $1\frac{1}{8}$  in. wide by  $\frac{5}{16}$  in. high with overlapping top edges, punched 4 in. o. c. for fastening.
- (b) Uniquely designed clips to be used in laying and locking the floor boards together and to the channels.

### ADVANTAGES OF THE LOXIT SYSTEM—

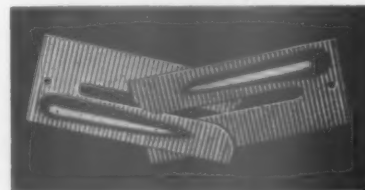
1. Total overall thickness of a Loxit laid floor including  $\frac{13}{16}$  in. flooring is  $1\frac{1}{8}$  in.
2. Floor can be laid without expansion joints as the Loxit system limits expansion.
3. Loxit floors can be laid tight, in fact the tighter the better, provided the usual precautions as to building conditions and acclimatization of the flooring have been taken, thereby securing a tight floor to start with.
4. Excessive shrinkage, repairs, and replacements can be easily and economically handled when floors are laid with the Loxit system because they can be taken up and re-laid without waste other than new clips.
5. Squeaks in wood floors are caused by vertical movement. When Loxit channels are properly shimmed and grouted and the flooring securely locked into place in accordance with instructions, vertical movement is eliminated and squeaking avoided.
6. Floors may be satisfactorily laid in basements and other areas where other types of wood flooring could not be used by following the simple precautions that are necessary under such conditions.
7. Loxit laid floors require only light sanding.
8. No special milling is required. All flooring milled in accordance with the gauge adopted by the hardwood flooring manufacturers' associations can be used.

9. Loxit being a simple mechanical system of few parts, can be mastered within a few hours by any experienced floor layer. There is only one set of rules to follow and only one way of doing the work properly, the same as any other mechanical assembly. This eliminates guessing, simplifies floor laying, makes supervision easy, and assures uniformly good results.

**HOW TO USE THE LOXIT SYSTEM**—Loxit channels are spaced 12 in. o. c. and lapped at the ends when floor area is more than 10 feet wide. They are secured to sub-floor using a suitable type of anchor, levelled, shimmed, and grouted. The wood flooring is laid in the same way that a nailed floor would be laid, but instead of using nails to fasten the flooring, a cleverly designed metal clip is used. The carpenter slips these clips into the channels immediately ahead of the last board and drives them into place by driving up the next board. The simple operation of driving up the board forces the clips to bite into and over the tongue of one board and embed themselves in the groove of the other, thus securely locking both boards together and to the channel. The tongues of the clips are slotted so that they automatically adjust themselves to the tongue and groove of the flooring.

**TECHNICAL SERVICE**—A staff thoroughly trained in the building business is at the disposal of architects and contractors for the study of unusual problems. This service is offered without obligation. Please consult us.

Type 1



**LOXIT INTERLOCKING METAL SHIMS**—Useful for the shimming of furring, sleepers, joists, girders, jamb lining bases, foundation plates, etc. Gauges 28, 22, 18—black iron and galvanized.



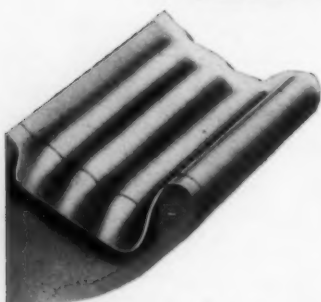
Detail showing Loxit floors in various stages of construction



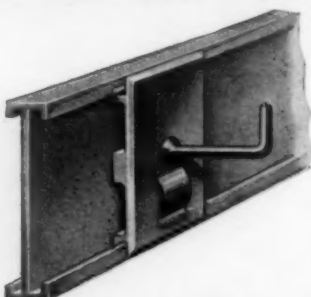
Close up of Loxit clips and channel

The carpenter's weight holds down the floor boards, so that the clips will seat properly

## LOXIT ALL-METAL BLACKBOARD AND CORKBOARD MOUNTING SYSTEM



Loxit "Sweep-out" End Closure  
Note Inclined Chalk Trough



Combination Snap-on Trim and  
Display Rail



Fig. 1  
Loxit blackboard mounting system in place showing construction

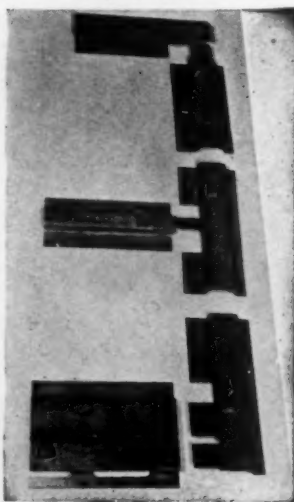


Fig. 2  
Loxit blackboard mounting system showing its structural parts in detail

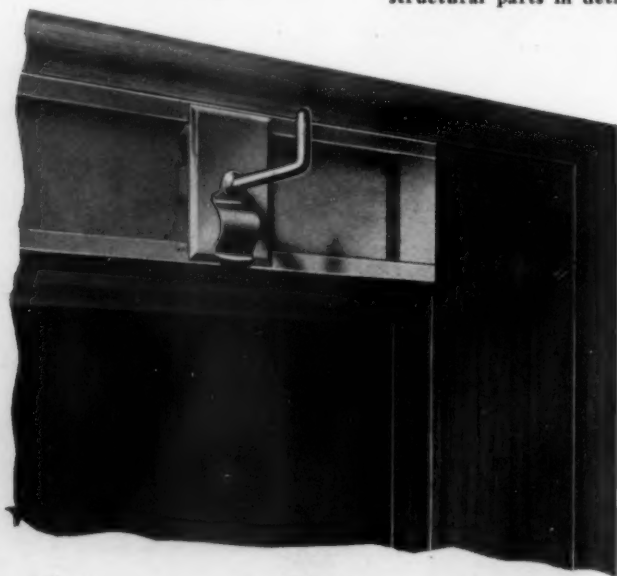


Fig. 6  
Loxit-Chromedge screwed on type of display rail with all accessories is available for use on existing blackboard and cork board trim where display rails have not been provided for

**THE SYSTEM**—The Loxit system is more than just a ground or trim. It is a complete system combining a plaster ground with snap-on trim, including keys, springs, inserts, and clips to receive and hold the boards and trim, as self-contained units. The system is designed to provide the maximum amount of adjustment, to assure rapid, economical and perfect installation and to maintain the permanent positions of the various parts after erection through automatic cushioning of the boards against reasonable contraction, expansion, settlement, etc.

**ERECTION**—It is so simple in principle and construction that any good workman can install it with ease and perfection. All grounds are drilled, slotted, and mitered at the factory to board dimensions shown in drawings, ready to set in place. Special alignment braces are provided for all corners, tees, and joints, making the setting of grounds easy and the placing of trim neat and true. The Loxit system can be used with any type and thickness of board from  $\frac{1}{8}$  in. to  $\frac{3}{8}$  in. the adjustment for variations in thickness being automatic.

### SPECIFICATIONS—

The system employed for this work shall be what is known as the Loxit all metal blackboard system. It shall be installed strictly in accordance with instructions issued by the Loxit Company, 605 W. Washington Blvd., Chicago. Same shall be complete with (or without) apron under chalk trough.

Grounds shall be secured to supporting walls with 10 penny wire cut nails (expansion or toggle bolts), at approx. 12 in. o. c. for blackboards and 18 in. elsewhere as required (or as directed by the architect). Grounds will be set with face flush with plaster line, plumb and true to board dimensions shown on drawings so as to assure the proper alignment for trim and tight closures of trim miters. Grounds shall be fabricated from 18 gauge U. S. S. extra tight coat galvanized sheet steel.

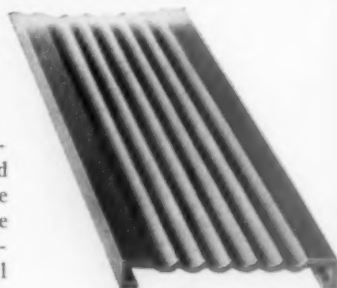
Trim shall be of snap-on design throughout. It shall be (satin finish, factory finish, chromalite finish, specify which is wanted) extruded Chromedge.

After blackboards and cork boards have been set by others, contractor shall apply all trim in a neat workmanlike manner, mitering the corners.

Chalk trough shall be Loxit inclined type (Standard Loxit flat type) with plain (or sweep-out) end closures.

Furnish the following accessories: 1 Pair of Loxit roller brackets for each run of display rail. One combination Loxit map hook and paper clip for each 18 in. of display rail.

**TECHNICAL CO-OPERATION**—A technically trained staff is at the disposal of architects, contractors, and school authorities for the study of special problems in connection with cork board, bulletin board, and blackboard installations.



Loxit Fluted Trim  
New—Decorative



# SERVICISED PRODUCTS CORPORATION

Manufacturers and Distributors

CONSTRUCTION  
MATERIALS

6051 West 65th St., Chicago 38, Ill.

REPRESENTATION IN  
ALL PRINCIPAL CITIES

Building Products — Sewer Jointing Materials — Industrial Products

## SPECIAL BUILDING PRODUCTS

**STANDARD ASPHALT PLANK . . .** A waterproof protection course for roof decks—also as a flooring for industrial and general plants—loading docks and platforms—storage plants, in fact any plant that requires resurfacing of old worn out concrete or wooden floors.

**MINERAL SURFACED ASPHALT PLANK . . .** Plank material for Bridges, Approaches, Railroad Crossings.

**ASPHALT PLANK PROTECTION COURSE . . .** Developed as a protection for concrete structure against infiltration of water.

**RIGID SHEATHING BOARD . . .** Building insulation material.

**ASPHALT CORRUGATED EAVE CLOSURE STRIPS . . .** Filler strips for corrugated roofing.

**\*RUBBER CORRUGATED EAVE CLOSURE STRIPS . . .** Corrugated roofing strip material.

**\*RUBBER TILE FLOORING . . .** Colorful flooring of tongue and grooved type.

**\*CORK-RUBBER FLOORING . . .** Used for gymnasiums, corridors, libraries and offices.

## SEWER PIPE JOINTING COMPOUNDS

**VITRIFIED-HOT-POURED COMPOUND . . .** A composition of tough flexible petroleum asphalt for vitrified clay pipe.

**TUFFLEX . . .** A cold premixed plastic trowelling compound that arrives on the job for immediate use.

**PREMOULDED SEWER PIPE BELT . . .** A belt shaped material that is calked between the bell and spigot of sewer pipes.

Write for Complete Information

\* (Not in production for the duration)

## VICTORY PARA-PLASTIC

The elastic, bond-sustaining waterproof seal. Hot-poured, rubber-like and extensible at low temperatures, *Para-Plastic* conforms to Federal Specifications SS-F-336, C.A.A. Specifications P-605 and Specifications of State Highway Departments.

Bonding firmly with concrete, steel or wood, it is the one-time installed, permanent guard against the infiltration of water or other foreign matter in joints and crevices.

Not affected by normal extremes of climatic or induced temperatures, the superiority of *Para-Plastic* solves a difficult construction and maintenance problem

Manufactured to our strict standard, *Victory Para-Plastic* meets the rigid demands of good construction practice.

## SERVICISED EXPANSION JOINTS

**PREMOULDED ASPHALT EXPANSION JOINT . . .** This joint is considered the standard joint and is generally used when special conditions do not require the use of other types.

**PREMOULDED FIBER EXPANSION JOINT . . .** An excellent product for extrusion control. The non-oozing feature makes this joint appropriate for use in monolithic construction, base pavement, concrete slabs, etc.

**PREMOULDED CORK EXPANSION JOINT . . .** A joint that is ideal for construction work where a resilient, non-oozing type of expansion is required. We recommend this joint for the construction of dams, swimming pools, reservoirs, bridges and highways.

**\*PREMOULDED CORK-RUBBER EXPANSION JOINT . . .** Where increased resiliency of product is desired for special work, we suggest Servicised Cork-Rubber Expansion Joint.

**PREMOULDED SELF-EXPANDING CORK EXPANSION JOINT . . .** An efficient joint especially designed for concrete slabs that contract beyond their original set.

**\*PREMOULDED SPONGE - RUBBER EXPANSION JOINT . . .** This was the first type of resilient joint designed. Its uses are very similar to those of Cork-Rubber and Cork, namely on bridges, retaining walls, dams, etc.



# SERVICISED PRODUCTS CORP.

6051 West 65th Street, Chicago, 38 Ill.

# MILCOR STEEL COMPANY

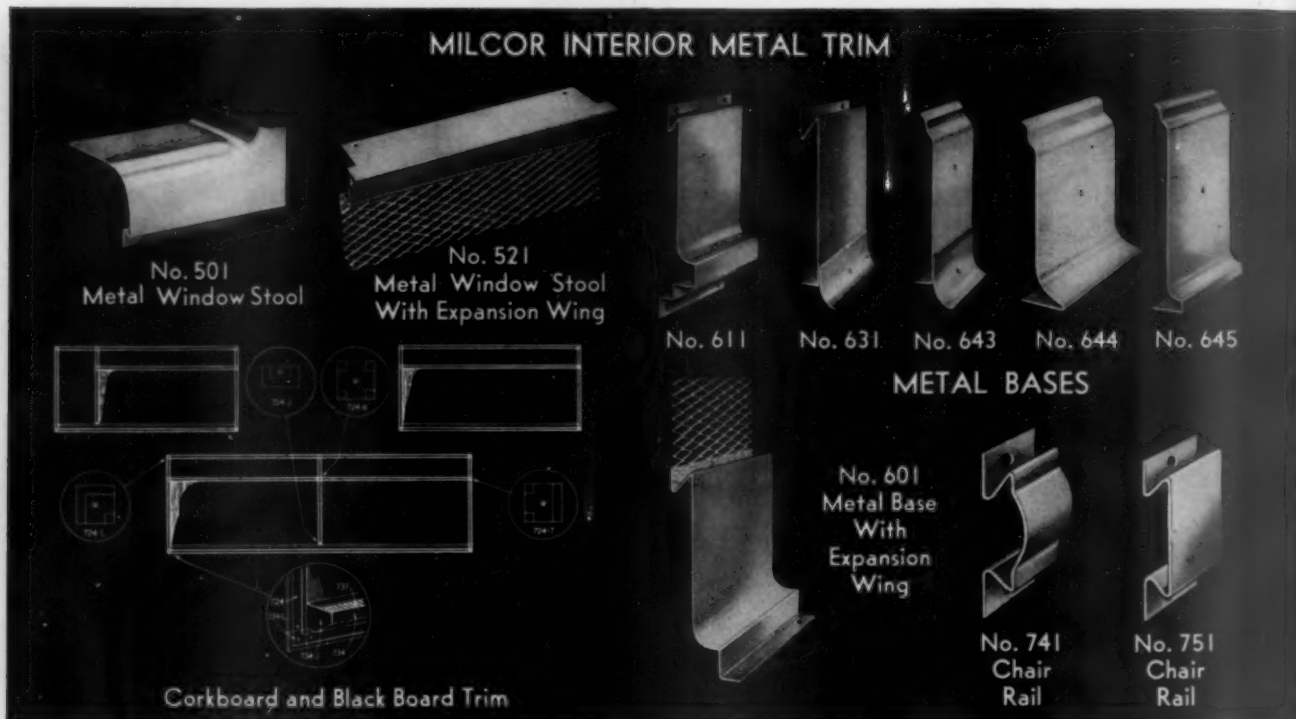
4153 West Burnham Street, Milwaukee, Wisconsin

Canton, Ohio  
Chicago, Illinois

Kansas City, Mo.  
Rochester, N. Y.

New York City  
Baltimore, Md.

## MILCOR INTERIOR METAL TRIM



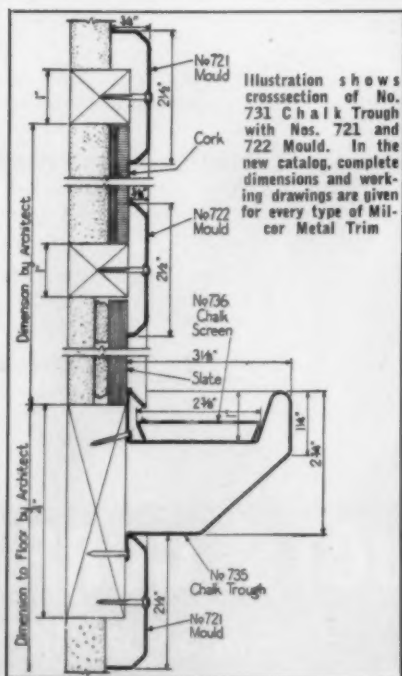
### METAL TRIM OF UNSURPASSED BEAUTY AND DURABILITY NOW AVAILABLE WITH INSULMAT SOUND DEADENING

Milcor Metal Trim is the finest interior trim available for modern school construction. Permanence, fire-safety, and resistance to abuse are a few of the reasons why this line has been specified in representative school construction in all parts of the country. Its attractive appearance and exceptional sanitation make it especially adaptable to school use. Every desirable type of interior trim may be found in the complete Milcor line.

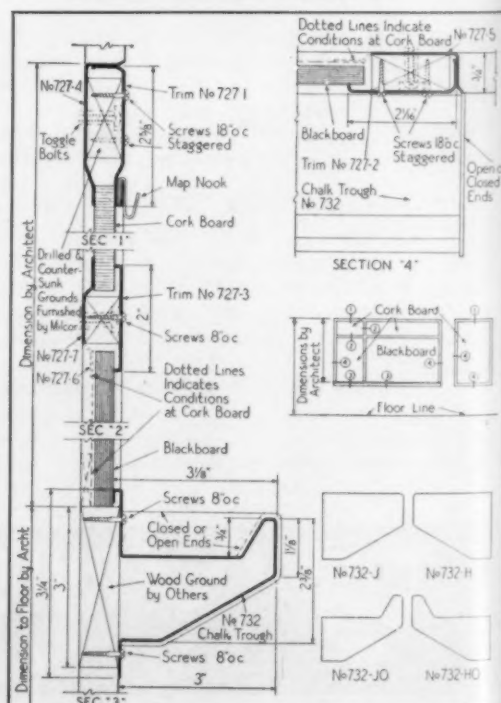
The Expansion Wing, which is an optional feature of many Milcor Metal Trim products, provides a permanent plaster bond, preventing checking and cracking of plaster at vulnerable points. And in schools, especially, it is desirable to preserve the original plastered surface.

Illustration at right shows cross-section view of No. 727 Series Cork Board and Blackboard Trim

Write for the 100-D Milcor Metal Trim Catalog—also for data on Sound Deadening



- METAL BASES
- METAL COVE MOULDS
- METAL CHAIR RAILS
- METAL BLACKBOARD MOULDS
- METAL CHALK TROUGH



## MILCOR PRODUCTS FOR SCHOOLS

### MILCOR VENTILATORS AND SKYLIGHTS

The Milcor "Nu-Air" is a steel top syphon Ventilator. Breakers and deflectors inside the wind band produce positive suction regardless of wind direction, and insure against back draft at all times. Its design takes into consideration all influencing conditions and compels it to function at all times.

The Milcor "Spinner" Ventilator has great exhaust capacity. The slightest breeze keeps it operating efficiently. As the head revolves, the air in the ventilator is expelled creating a vacuum which draws the impure air from the building. Down drafts are an impossibility with this construction.

The Milcor Line of Skylights covers all types and sizes. We furnish recommendations to meet special requirements.

Send for literature describing and illustrating Milcor Ventilators and Skylights



### MILCOR FIRE-PROOF BUILDING MATERIALS

There is no better plaster base for walls and ceilings of school buildings than metal lath. Its scientifically designed mesh gives it a positive plaster grip. There is no plaster waste with this lath, and yet every inch of wall surface is locked permanently into place.

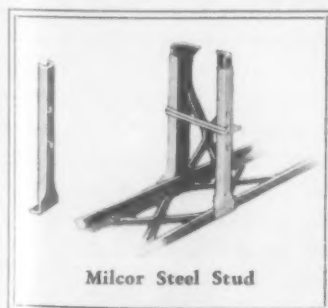
Expansion Casing provides a practical door and window trim. The flush-type junction of wall and casing insures a sanitary finish, with no cracks to become clogged with dirt.

Milcor Expansion Corner Bead is made for outer and inner angles, and its precisely true nose makes a neat, safe, straight line corner. The Expanded Wing, an integral part of the bead, permits the plaster to key through and form a strong bond with the lath beneath, protecting against corner cracks either from blows or strain due to settling.

Write for the Milcor Manual—for complete information on Fireproof Products

### MILCOR PARTITION SYSTEMS

These two systems are important contributions to fire-proof construction. The ease with which they can be constructed reduces labor cost considerably and at the same time makes possible partitions of exceptional rigidity and permanence. Certified fire-resistance makes them the partitions for school construction.



#### MILCOR STEEL STUD FOR HOLLOW PARTITIONS

Sound resistance, insulating value, and resistance to shocks and abuse are a few of the outstanding advantages of this system. Write for detailed literature.

#### MILCOR SOLID 2-INCH PARTITION AND FURRING SYSTEM

Only four units comprise this system:

1. Ceiling Angle Runner
2. Slotted Channel Stud
3. Continuous Crimp Floor Runner
4. Milcor Metal Lath

Its labor saving simplicity reduces cost and speeds construction. Detailed literature supplied upon request.



Milcor 2" Solid Partition and Furring System



# DAVID E. KENNEDY INC.

General Office and Plant

58 Second Avenue, Brooklyn 15, N. Y.

30 N. Michigan Ave., Chicago 3, Ill.  
1815 W. 11th St., Los Angeles 6, Calif.

208 Bona Allen Building, Atlanta 3, Ga.  
Boston, Mass.: 810 Chestnut St., Waban

815 Superior Ave., Cleveland 14, Ohio

Established 1899

## KENTILE

*Asphalt Tile*



has been a favorite flooring for schools and universities for 18 years. It is a compression of asphalt, asbestos and coloring pigments made in the plant of David E. Kennedy Inc., oldest manufacturer of resilient floor tiles in America.

Made in tile form, it is bonded to underfloors with cement by over 1,000 trained, authorized contractors located in every section of the United States.

This insert attempts to describe Kentile and list its features briefly. We suggest, though, that if you are contemplating any new building or alteration you write us to send you samples for testing and complete technical information. Kentile is so much a leader for floors that you really cannot claim to have explored the field until you have at least considered this material thoroughly. Kennedy's color booklet and samples will be sent without any obligation and a representative will be sent to furnish estimates if requested.

### COST

**Q.** Is Kentile costly?

**A.** Kentile is asphalt tile, the lowest cost long wearing resilient tile flooring sold—foot by foot, every time! Furthermore, its installation is so fast and easy it costs less installed! Finally, it wears so much longer it is incomparably cheaper.

### UNDERFLOOR

**Q.** Does Kentile require a sub-base?

**A.** Kentile can be laid directly on any smooth, clean, firm underfloor—without any lining or sub-base—without special treatment. Kentile laid on every kind of base—wood, concrete, etc.—has given perfect wear from 10 to 15 years.

THE AMERICAN SCHOOL AND UNIVERSITY—1944

### GREASEPROOF KENTILE

*Greaseproof Kentile is a development of particular interest to planners and managers of cafeterias, laboratories, work shops and any other areas where grease is likely to fall. It is absolutely unaffected by any animal, vegetable or mineral oil, grease or fat known. Greaseproof Kentile costs only a few cents more than standard Kentile and since it matches 16 standard Kentile colors it can be used only where needed. We will gladly send you our free Grease Testing Kit without any cost or obligation and you can compare Greaseproof Kentile with any other floor material for yourself.*

### MOISTURE

**Q.** Will moisture affect Kentile?

**A.** Kentile is made of asphalts, asbestos fiber and pure mineral pigments—with absolutely nothing added that can be affected by moisture. It can't rot, mould, disintegrate—even when laid in cellars on concrete in direct contact with earth.

### RESILIENCE

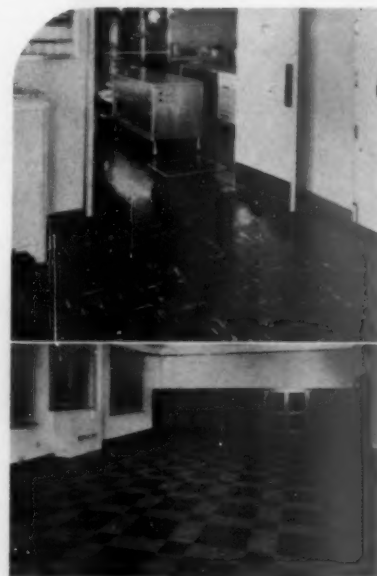
**Q.** Is Kentile comfortable underfoot?

**A.** One surprising thing about Kentile is that, despite its remarkable toughness, it is "soft" and resilient. This "springiness" means foot-comfort—with a consequent reduction of fatigue for those who stand or walk on a Kentile floor all day.

### MAINTENANCE

**Q.** What care does Kentile require?

**A.** Kentile is kept clean, smooth, and perfect through the years with no more attention than an occasional washing with mild soap and water—and nothing else. Some people like to wax their floors occasionally but this is not necessary.



### FIRE SAFETY

**Q.** Do fire underwriters approve Kentile?

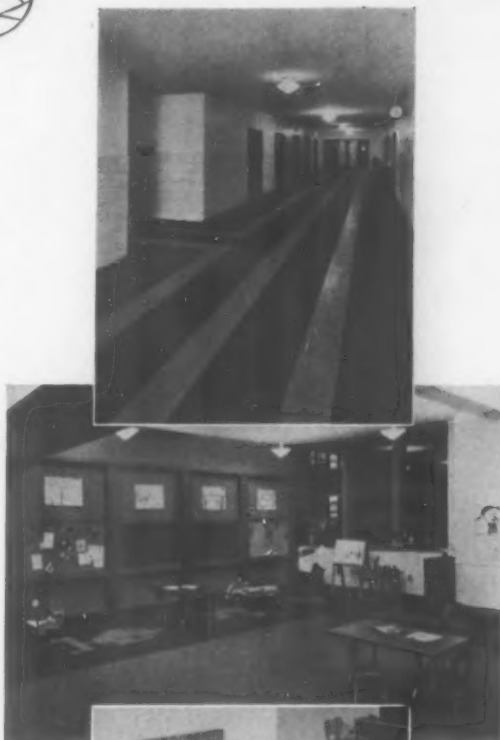
**A.** Kentile meets every and any requirement of fire underwriting boards in every part of the country. It is virtually fireproof (being composed almost entirely of asphalt and asbestos) and is the most fire-resistant type of resilient flooring made.



Manufactured by DAVID E. KENNEDY INC.

will be found in the following schools (and hundreds of others)

Johns Hopkins Medical School,  
Baltimore, Md.  
Yale University,  
New Haven, Conn.  
Queens College,  
New York City  
Hunter College,  
New York City  
Middlebury College,  
Vermont  
Lincolndale School,  
New York  
Manhattan College,  
New York City  
Middletown High School,  
New York  
Forest Hills High School,  
New York City  
Wm. Howard Taft High School,  
New York City  
Hampton & Jackson Schools,  
Minneapolis, Minn.  
Mt. Providence School,  
Pittsburgh, Pa.  
Ripley Central School,  
Ripley, New York  
Millbrook School,  
Yonkers, N. Y.  
Our Lady of Mercy High School,  
Rochester, N. Y.  
Clark College,  
Atlanta, Ga.  
Sienna College,  
Loudonville, N. Y.  
Northfield School,  
Northfield, Mass.  
Mandelin College,  
Chicago, Ill.  
Atlanta University,  
Atlanta, Ga.  
Connecticut College for Women,  
New London, Conn.  
Will Rogers High School,  
Tulsa, Oklahoma  
Northampton High School,  
Northampton, Mass.  
Malverne School,  
Malverne, L. I.  
University of Georgia,  
Athens, Ga.  
University of Florida,  
Gainesville, Fla.  
Georgia School of Technology,  
Atlanta, Ga.  
University of Alabama,  
Tuscaloosa, Ala.  
Florida State College for Women,  
Tallahassee, Fla.  
Purdue University,  
Lafayette, Ind.  
Steinmetz High School,  
Chicago, Ill.  
Wendell Phillips School,  
Chicago, Ill.  
University of Minnesota,  
Minneapolis, Minn.  
University of Arkansas,  
Fayetteville, Ark.  
Northwestern State Teachers College,  
Alva, Okla.  
Franklin School,  
Merrill, Wis.



## PATTERNS

**Q.** How many patterns in Kentile?

**A.** Kentile does not come in sheets; it is made in loose tiles. There are 15 tile sizes (plus strips and special sizes), each in 44 colors. No one knows how many combinations are possible; every floor can be different.

## COLOR WEAR

**Q.** Will Kentile's colors wear off?

**A.** Kentile's colors are not on the surface. They are part of the very pigmentation of every grain—they go right clear through to the back of the tile with absolutely no decrease of strength. Nothing can "wear them off."

## DURABILITY

**Q.** How will Kentile wear?

**A.** Kentile floors laid 15 years ago—in crowded hallways—are still perfect today. This tough yet resilient material is virtually unequalled for wear. It shows no mop marks—isn't scarred by scuffing—resists traffic impact—never curls or buckles.

## SURFACE GRIP

**Q.** Is a Kentile floor slippery?

**A.** Although Kentile's surface is always smooth it is not slippery. Its completely invisible graining affords a sure-tread grip for soles, even when wet. That is one reason it is preferred in schools, hospitals, play rooms and similar areas.

## ALTERATIONS

**Q.** Can Kentile floors be altered?

**A.** One of Kentile's unique advantages is the fact that new tiles can be laid anywhere without affecting the rest of the floor. Thus, if counters, machinery or even whole walls are moved, an entirely new floor is not needed.

## STAINING

**Q.** Can anything stain Kentile?

**A.** None of the things that ordinarily dirty floors can stain Kentile—not even common alkalis and acids. They wash right off the smooth surface. And Greaseproof Kentile is absolutely impervious to all animal or vegetable fats, greases and oils.

## QUIET

**Q.** How does Kentile rate acoustically?

**A.** Kentile muffles footsteps. Even in crowded corridors ordinary traffic noises are greatly reduced. (Note: a tile in your hand seems hard and drum-like; when cemented down it is resilient and remarkably quieting.)

THE AMERICAN SCHOOL AND UNIVERSITY—1944

# THOS. MOULDING FLOOR MFG. CO.

EXECUTIVE OFFICES

165 West Wacker Drive, Chicago 1, Ill.

DISTRICT SALES REPRESENTATIVES IN ALL PRINCIPAL CITIES

THOS. MOULDING

## Moultile

Flexible Reinforced  
MASTER ASPHALT TILE

Moultile Master Asphalt Tile combines all the qualities desirable for school floors. It is highly decorative, quiet underfoot, and has a pleasant resilience and elasticity. Moultile is low in original cost, and exceptionally low in maintenance cost.

Durability is an outstanding characteristic of Moultile Asphalt Tile. Millions of scuffing, scraping feet will cause no perceptible wear . . . will not affect color and texture which are uniform throughout. Moultile, therefore, requires no expensive periodic refinishing.

Moultile is ideal for classrooms, corridors, and lobbies. In gymnasiums it yields a secure footing which does not tire contestants or cause floor burns and may quickly be waxed for dancing.

### Reinforced for Extra Strength

Because of its strength Moultile can now be applied over firm, smooth wood sub-floors with results heretofore expected only of asphalt tile over cement. It is truly inert and remains permanently bonded to subfloor. Because of its flexibility, Moultile quickly seats itself to the under-floor, permitting immediate use after installation.

### Ideal for Basement Floors

Moultile and the asphalt cement in which it is laid are impervious to the

PRODUCTS	
FLOORS	WALLS and WALL BASES
<b>Tile</b>	<b>Moultile Walls</b>
Moultile	Greaseproof Walls
Greaseproof	Acid-Resistant Walls
Acid-Resistant	Asphalt Core Base
Non-slip Safety	Butt Type
	On-top Type
	Asphalt Straight Base
<b>Trowelled-on</b>	
TMS	
Moultile	
Asphalcrete	
Underlayment	
	<b>MAINTENANCE MATERIALS</b>
<b>PLASTIC SPECIALTIES</b>	Permagloss Self-polishing Wax
Moultread Stair Tread and Nosing	Sweepolene Sweeping Compound
Flexedging	Kleenolene Non-caustic Soap
<b>INSTALLATION</b>	
Thos. Moulding and other approved flooring contractors contract to install floors anywhere in the United States and nearby countries. Write for samples and complete technical information on Moultile and the Company's other products, listed above.	

alkali and dampness always present in cement resting on the ground, which destroy other types of flooring. Moultile bonds permanently, does not buckle or loosen and will not rot or decompose. It solves the problem of flooring over cement resting on the ground.

### Many Colors and Sizes

For the duration, Moultile is available in approximately 25 plain and marbled colors; in  $\frac{1}{4}$ ,  $\frac{3}{16}$ , and  $\frac{1}{2}$  in. thicknesses, and in sizes 9 x 9, 12 x 12, and 18 x 24.

THOS. MOULDING

## Greaseproof

TILE

Thos. Moulding Greaseproof Tile resists the grease and oils that discolor and soften other floor coverings. It is ideal for domestic science rooms, kitchens, cafeterias, and machine shops. This flooring has the same resilient buoyancy, the same high strength and other characteristics of Thos. Moulding Moultile.

THOS. MOULDING

## Acid-Resistant

TILE

Thos. Moulding Acid-Resistant Tile withstands acidic and alkaline chemicals which are harmful to other types of floor coverings. It is recommended for laboratory installation and for lavatories. It has all the characteristics of Moultile . . . durability, comfortable underfoot resiliency, etc.

### MAINTENANCE MATERIALS

Good floors deserve good care. The following maintenance materials, specially developed for use on Moultile, are recommended as being safe, efficient and economical for use on all floor coverings.

**Permagloss**—A bright-drying, self-polishing liquid floor wax which contains no oil, grease or other harmful solvents.

**Kleenolene**—A non-caustic liquid soap which will not injure floors or finishes.

**Sweepolene**—A sweeping compound made with wax instead of the oil found in commercial compounds.

Kindergarten, Crow Island School, Winnetka, Ill.

Thos. Moulding Flexible Asphalt Base and 30,000 ft. Moultile  
Eliel Saarinen -Eero Saarinen-Perkins, Wheeler & Will, Architects

Northwestern Technological Institute, Evanston, Ill.

170,000 ft. Thos. Moulding Acid-resistant Tile and  
Standard Moultile  
Holabird & Root, Architects

THE AMERICAN SCHOOL AND UNIVERSITY—1944



## THOS. MOULDING

*Wall Tile*

A beautiful, enduring wall treatment which requires no periodic refinishing.

Thos. Moulding Wall Tile is a permanent wall finish which may be installed over smooth plaster. Thos. Moulding Standard Wall Tile is made from the same type of materials and is fabricated by the same process as Thos. Moulding Moultile. Where special protection is required, however, Thos. Moulding Wall Tile is also available in Acid-Resistant and Greaseproof types.

The use of Thos. Moulding Wall Tile eliminates, once and for all, the periodic cost of papering, painting, calcimining, etc. Only an occasional washing is needed. Waxing produces a rich, glossy finish. It is strong, durable, non-absorbent, sanitary and fire-resistant.

Thos. Moulding Wall Tile is made in  $\frac{1}{8}$  in. thickness only. Standard Wall Tile is available in the same range of colors and sizes as Moultile.

## THOS. MOULDING

*Asphalt Base*

**FLEXIBLE,  
EXCEPTIONALLY  
STRONG**

Thos. Moulding Flexible Asphalt Base is an economical, sanitary and highly decorative base for use with asphalt tile, linoleum, linoleum tile, rubber, cork, etc. It is exceptionally strong, and being so flexible, conforms readily to wavy walls and is easily bent around corners and pilasters. It is available as Butt Type or On-top Type Cove Base or as Straight Base and can be furnished to match all colors of Moultile.

## THOS. MOULDING

*Safety Tile*

Provides positive, non-slip undertoot safety, even when wet.

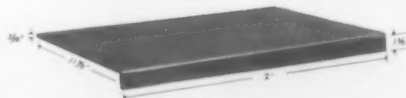
Thos. Moulding Safety Tile is a floor tile in which non-slip chips, incorporated during the manufacturing process, give it a surface appearance similar to terrazzo and positively eliminate the slip hazard, even when the floor is wet. Thos. Moulding Standard Safety Tile has all the characteristics of Moultile and is similarly installed. It is also available in the Acid-Resistant and Greaseproof types.

Thos. Moulding Safety Tile is now widely used in front of elevators, on stair treads, under revolving doors, and in vestibules, stair entrances, ramps, etc., wherever underfoot safety is essential.

## THOS. MOULDING

*Moultread*

STAIR TREAD



Thos. Moulding Moulthread is a combined stair tread and nosing characterized by good wearing qualities. Because the tread and nosing are of one piece, it eliminates the joint which in other materials constitutes a tripping hazard. Moulthread is easily cut to fit, and because of its flexibility is easy to apply. Also due to its flexibility, Moulthread makes perfect contact with the sub-tread . . . will not rattle. Moulthread is also available in the Non-slip Safety Tile type for added protection against slipping.

Moulthread may be installed over old or new treads of wood, cement, marble,

steel terrazzo, etc. Gluing only is required . . . no drilling or anchoring as in the case of metal nosing. Cupped portions are filled with Thos. Moulding Asphaltcrete.

## THOS. MOULDING

*Moulstone*

COMPOSITION FLOORING

Moulstone is a plastic material troweled on subfloors to form a smooth, seamless surface. It is very economical, ready for use almost immediately, and light in weight. It can be paneled and banded in different color combinations or scored to resemble tile. Moulstone resists oil and grease and is also fire-proof. By reason of its high tensile and compressive strength, Moulstone is ideal for use over old wood floors, particularly those in bad condition.

Moulstone has the unusual property of inhibiting development of the fungus which causes athlete's foot. It is therefore recommended for use in locker rooms, toilets and areas surrounding showers.

A special water-proof type of Moulstone is now available for use within shower stalls.

## THOS. MOULDING

*Underfloor*

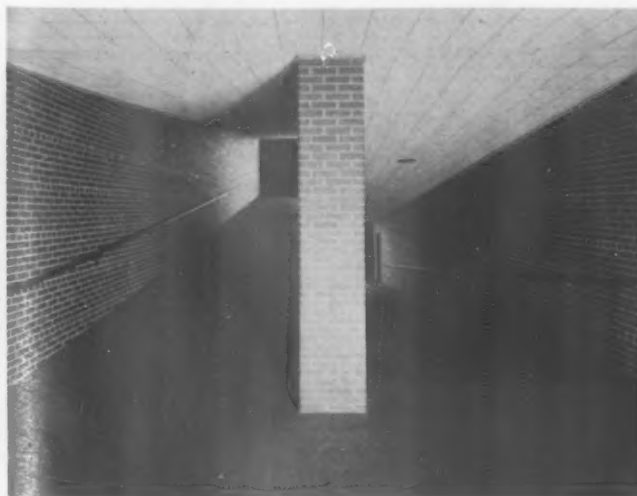
TREATMENTS

Virtually any old cement or wood floor, no matter how bad its condition, can be made into a suitable foundation for floor coverings through the application of Thos. Moulding Underfloor Treatments. These materials have been specially developed by Thos. Moulding to smooth and strengthen subfloors that are cupped, cracked, uneven or springy.

Thos. Moulding also specializes in the repair of magnesite and mastic floors.

Thos. Moulding Safety Tile on Ramps  
Grafton High School, Grafton, W. Va.  
Edward J. Wood & Son, Associate Architects

St. Francis de Sales School, Minneapolis, Minn.  
Game lines, inlaid with Moultile, never need painting  
Ellerbe & Co., Architects



THE AMERICAN SCHOOL AND UNIVERSITY—1944

# CONGOLEUM-NAIRN INC.

General Office: Kearny, New Jersey

*for longer wear,  
easier maintenance,  
more and more schools  
depend on  
NAIRN LINOLEUM*



● J. W. Sexton High School, Lansing, Michigan

● It takes a tough material to resist the hard wear children give school floors . . . it takes a material like Nairn linoleum.

In addition to being unusually wear-resistant Nairn floor linoleum is inexpensive to install . . . has a smooth, sanitary, easy-to-clean surface . . . needs no costly refinishing even after years of constant wear.

Nairn wall linoleum is handsome, washable, **permanent** . . . is fade-proof, crack-proof, water-proof.

More and more schools are using Nairn Linoleum on floors and walls to help create a pleasant, restful atmosphere. Superior beauty and durability as well as sanitary and insulating qualities recommend it for use in remodeling as well as in construction.

For catalogs, samples and free assistance in your wall and floor problems, write Congoleum-Nairn Inc., Kearny, N. J.

# NAIRN

Reg. U. S. Pat. Off.

LINOLEUM FLOORS AND WALLS

THE AMERICAN SCHOOL AND UNIVERSITY—1944



● Instrumental band room, floor pattern #2956 . . . risers pattern #2976 . . . feature strips patterns #1119 and #1129



● Food laboratory, floor pattern #2974 . . . border pattern #2923 . . . walls pattern #7971 . . . table tops pattern #1126



● Study Hall, walls pattern #7971 . . . floor pattern #2956 . . . 18" border #1104

# TILE-TEX...FLOORS FOR THE MODERN SCHOOL



Willard Hall Dormitory for Women—Northwestern University, Evanston, Ill.

Tile-TEX is an asbestos-asphalt composition tile flooring, which has been used for seventeen years in schools throughout the United States. Tile-TEX floors give uniformly good service, represent on the average a low investment cost per square foot, and are maintained simply and economically. They represent what we honestly believe to be the greatest value in floors for schools that can be purchased today.

Tile-TEX is designed and manufactured to meet the demand for a low cost flooring, installed in tile size units, that will withstand heavy foot traffic under exacting conditions over a long period of years. Prominent school architects throughout the nation specify Tile-TEX consistently and know from experience that the Company manufacturing it can be relied upon to stand behind the material and improve it year after year.

On the following pages are photographs showing Tile-TEX in use in practically every type of area found in schools today. Tile-TEX is often specified because of this versatility and adaptability to a wide variety of uses. Hundreds of Tile-TEX installations in schools throughout the country are mute testimony to the quality of the product and the knowledge and skill of the Tile-TEX contractors who install it.

Tile-TEX is available in three thicknesses— $\frac{1}{8}$ ",  $\frac{3}{16}$ ", and  $\frac{1}{4}$ ". It is made in a wide variety of sizes, which include the following: 3x3, 3x6, 4x4,  $4\frac{1}{2}$ x $4\frac{1}{2}$ , 4x12, 6x6, 6x12, 6x18, 9x9, 9x18, 9x27, 12x12, 12x24, 18x18, 18x24, and 6" Hexagon.

Tile-TEX welcomes constructive criticism from all school officials and is constantly ready to help in the solution of any problems connected with school-house floors.





The Tile-Tex floor shown above is in the Southampton, L. I., N. Y., Grade School. It is long-wearing, non-distracting to the pupil, easy to keep clean, and suitable for either fixed or movable seating equipment.

For auditoriums, Tile-Tex is flexible in design, adapted for ramps and inclines, easy to clean, and durable. Below you see Tile-Tex in service in the auditorium of the Bay Shore, L. I., School.



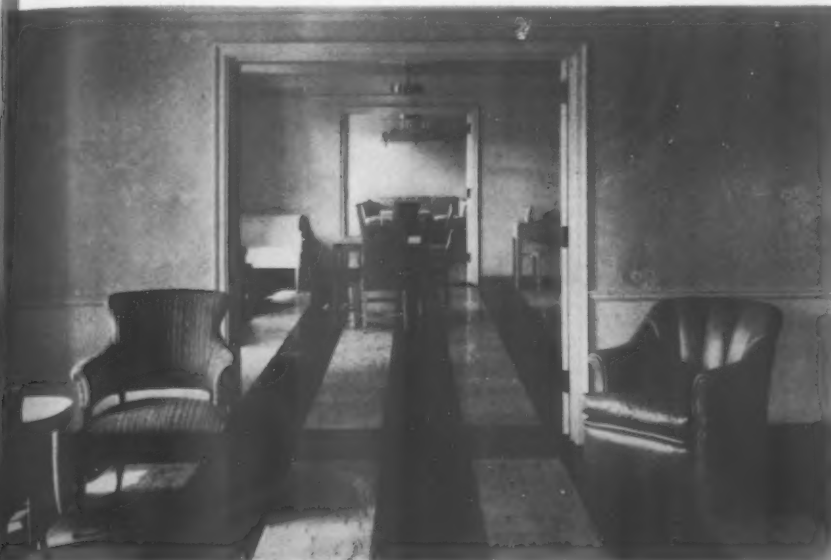
Top photo below—For special areas, such as a domestic science room, Tile-Tex is both practical and attractive. Here ease of cleaning, closely textured surface, and resistance to food abuse are met by the use of Greaseproof Tile-Tex. Installation shown is the domestic science room in the Wappingers Falls, N. Y., Central School.

Bottom photo below—For laboratories, Tile-Tex is acid and alkali resistant, comfortable to stand and walk on, and easy to clean. Tile-Tex was selected for the Guggenheim Dental Clinic laboratory, New York City, because of these qualities.



Right—School corridor areas are a “natural” for Tile-Text floors. The corridor floor shown here, in the Southampton, L. I., Grade School, is safe to walk on, attractive, easy to maintain, quiet, durable, and economical.

Below—For this social room area, in Northwestern University's new Willard Hall, Tile-Text was found to be the perfect answer for an attractive, serviceable floor, so necessary for this type of use. Note the striking modern design.




Above—Kindergarten, Mattituck, L. I., N. Y., for children to play on, quiet, attractive, sanitary, and Grade School. Here is a Tile-Text floor that is safe easy to clean.

Right—Tile-Text was the answer to the floor problem in the gymnasium at St. Vincent's School, Buffalo, New York. Unaffected by moisture, non-slip when unwaxed, and sufficiently resilient, Tile-Text makes an excellent gymnasium floor.




## TILE-TEX WALLS ARE IDEAL FOR SCHOOL WAINSCOTING

Tile-Tex Wall Tile is a new and adaptable wall covering material, well suited for school purposes. It is a flexible, individual tile manufactured from asbestos fibre, mineral coloring pigment, and special binders. Tile-Tex Wall Tile can be applied over existing plaster walls in present buildings, or over smooth plaster backing or smooth-surface wallboard in new construction. Its cost is considerably less than that of conventional ceramic tile.



Above you see Tile-Tex used as an attractive corridor wainscot. Its use here obviates the need of painting over that area covered by the wainscot. Over a period of years, this means a considerable saving as against paint or any other type of surface which must be renewed. Fingerprints, so common on painted walls, will not show up on appropriate, selected colors of Tile-Tex. Any dirt marks or stains can be easily removed with a damp rag and Kitchen Klenzer.



Right—In cafeterias, Tile-Tex has proved itself an excellent wainscot material. In the Wappinger Falls, N. Y., Central School shown here, the wainscot is plain color Tile-Tex Wall Tile. Incidentally, the floor here is also Tile-Tex, laid in colors to harmonize with the wall tiling.

Other areas where this new, unique wall covering can be used are toilets, rest rooms, and laboratories.

**Colors**—Tile-Tex Wall Tile is available in a wide range of colors, from light pastel shades to medium and darker hues. Over 32 colors are included in the Aristocrat color group. Send for the booklet, "Decorative Walls by Tile-Tex," which includes complete color charts.

**Sizes**—Fourteen sizes, from small to large, make possible wall treatments heretofore not obtainable with other types of material. Sizes include the following: 3x6, 4x4, 4½x4½, 4x12, 6x6, 6x12, 6x18, 9x9, 9x18, 9x27, 12x12, 12x24, 18x18, and 18x24.



**THE TILE-TEX COMPANY** CHICAGO HEIGHTS, ILLINOIS  
101 PARK AVENUE, NEW YORK



# THE MICHAELS ART BRONZE CO, INC.

Second and Court, Covington, Ky.

## PRODUCTS

Bronze Tablets and Signs • Bronze Doors and Casement Windows • Name Plates • Office and Lighting Fixtures • Bulletin Boards • Building Directories • Railings • Desk Sets • Lamp Standards • Grilles and Wickets • Radiator Grilles • Kick and



## PRODUCTS

Push Plates • Push Bars • Time-Tight Exhibit Cases • Cast and Extruded Thresholds • Wire Work (Partitions, etc.) • Marquise, and many other ferrous and non-ferrous metal products.

Michaels Bronze Tablets and Signs are manufactured in a wide variety of designs, shapes and sizes to meet all school and college requirements. A few are illustrated below. Bronze, virtually indestructible, is the ideal metal for permanent memorials. It lends itself readily to the hands of skilled craftsmen and becomes more beautiful as time goes by. Many designs may be furnished from standard patterns or modeled to your specifications. We shall gladly submit sketches and quote prices. When necessary, additional blue-

prints will be furnished for approval. Just tell us the space, the purpose of the tablet, and the wording to be used. Fully illustrated folder will be sent on request. Until the war is over, Michaels' entire resources will be engaged in the manufacture of war needs. After victory has been won, Michaels will resume the creation and production of Bronze Tablets and Signs, Time-Tight Exhibit Cases, and scores of other peacetime needs. In the meantime, we shall be glad to furnish complete information on any of the products listed above.



Although the installation must be postponed until after the war, it is not too early to plan a lasting memorial in recognition of those who served and sacrificed their lives that our nation might remain free. And what more fitting memorial than a Michaels Art Bronze Tablet? One of many designs is illustrated above.



Bronze Tablets commemorate the construction of buildings or perpetuate the memory of public servants and benefactors who dedicated their lives to the service of mankind. Many designs, plain and ornate, in sizes to meet your requirements, are available for such tablets.

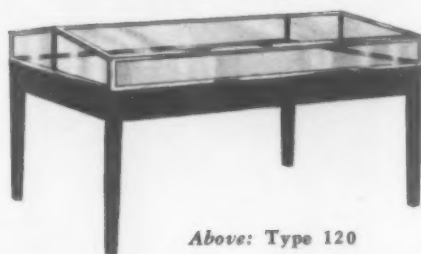


Laurel design with contoured top. Bears intaglio portrait. Tablet size 20" x 25"



Bronze name plates in any size, with or without title

## Michaels Time-Tight Exhibit Cases with Internocking Frames



Above: Type 120

Left: Type 130

Michaels Table Cases, Wall Cases, Aisle Cases, Suspended Cases, Recessed Cases, or Special Cases are manufactured with either extruded bronze or aluminum frames, and all have Michaels' exclusive internocking fea-

ture. Satin finish is standard, but if desired, electroplated or polished finishes may be supplied. Frames take full 1/4" polished plate glass. Shelves of glass, 1/4" or 1/2", depending on weight requirements, have all four edges polished. Shelf supports are adjustable every inch. Paracentric locks are standard in all locked cases. No screws are exposed on the face of frames except where necessary for removable or hinged panels. If illumination is necessary, it will be the latest and best type. Illustrated folder giving complete specifications will be sent on request.

# P. O. MOORE, Inc.

300 Fourth Avenue

Telephone — ALgonquin 4-5628

New York 10, N. Y.



## ← BEFORE!

You may be bedeviled, perplexed and confused with a messy, disordered, topsy-turvy collection of keys. But after you get your TelKee System, they'll soon be in apple-pie order.

We believe you'll agree, (1) that a misplaced key is a wasteful nuisance, (2) that duplicate keys should always be made from an original Pattern Key and not from another duplicate, (3) there's always the danger of important keys getting into the wrong hands, (4) that obviously an accurate quick account-

ing method is desirable and, (5) that a safe, simplified system for preservation of all keys and therefore also the locks, will save time, material and money.

TelKee's Safe Simplified Visible Key Control Systems and Equipment will solve your key problem once and for all.

## AFTER →

Your keys will be systematized like those illustrated in this section of a TelKee panel.

Details about the System and New Hardwood Lockers will gladly be sent you—and of course at no obligation on your part.

Tell us how many sets of keys you want to systematize and we'll do the rest.



# TELKEE

TRADE MARK

**VISIBLE KEY CONTROL SYSTEM**  
Will Be a Source of Satisfaction

THE AMERICAN SCHOOL AND UNIVERSITY—1944

# **"SAFE TREAD" PRODUCTS**

**for safe walkway surfaces**



**abrasive metals**

**pages 2-3-4-5**

**abrasive plastic**

**pages 5-6**

**abrasive tile**

**pages 6-7**

**abrasive aggregates**

**pages 6-7**

**THE SAFE TREAD CO., Inc., 30 Vesey St., New York**



# "SAFE TREAD"

## ... for safe walkway surfaces

The Safe Tread Company, Inc., is headed by a past President of the American Society of Safety Engineers, who pioneered in the design and production of abrasive metal products for structural purposes, and who, for over 25 years, has been one of the leading figures in the nation-wide effort to overcome the serious hazards of unsafe walkways.

Associated with him are competent engineers, manufacturers, and sales representatives, specially trained in this particular field.

Architects, engineers and others, in their efforts to overcome the vicious slipping hazards that are one of the most common and costly sources of personal injury, have been greatly handicapped by the hitherto limited variety of suitable and dependable SAFE walkway materials.

"SAFE TREAD" products have been developed to provide not only dependable, enduring, underfoot safety, but also an adequate range of forms and materials for selection and adaptation to almost any condition of service and architectural scheme.

The facilities of one non-ferrous and three iron foundries, and one of the leading abrasive grain manufacturers, are utilized in the production of "Safe Tread" products, under exclusive material, design and process patents and licenses.

With a background of such sound experience, practical knowledge, and manufacturing facilities, "Safe Tread" products may be specified with full confidence that they will provide the best available enduring anti-slip walkway surface.

*Consultations on walkway safety problems and tentative estimates on preliminary surveys may be obtained without obligation.*

### "SAFE TREAD" ABRASIVE METALS

#### The "Safe Tread" Process

"Safe Tread" Abrasive Metal is made by a *patented process* which produces anti-slip treads having the diamond-hard abrasive:

(1) Deeply embedded in and firmly held by the metal *without an intervening film of foreign material* to weaken the grip of the metal on the abrasive. (When the abrasive grains are sprayed or coated with a foreign substance to prevent washing or floating as the molten metal enters the mold, the metal cannot make intimate contact with them—a condition that clearly affects the durability of the tread.)

(2) Projecting slightly to give a safe footing under all conditions. (Unless the grains project slightly above the metal to give the necessary "bite" the surface is no more anti-slip than metal

without any abrasive); and

(3) Closely distributed in the surface so that the metal is protected from wear.

#### Scope of Use

"Safe Tread" Abrasive Metals are suitable for *inside or outside*—wherever slipping is to be prevented or excessive wear withstood, in either new or repair work. It has met the most exacting requirements and has been furnished for over 6,000 outstanding projects during the past ten years; by direct purchase under the rigid inspection of the U. S. Navy; on contracts for public buildings, including postoffices, hospitals, schools, etc., and for private work including office buildings, stores, churches, dairies, packing houses, factories, railroads, subways, etc.

Only "SAFE TREAD" made with five different surfaces . . .

#### Specifying and Ordering

When specifying Abrasive Metals, the kind of metal, surface design, thickness and form desired should be indicated. When ordering or requesting estimates, complete information should be furnished. Detail drawings by the architect or shop drawings by the ornamental iron worker assure closer estimates and accurate filling of orders.

#### SIZE LIMITS OF ABRASIVE METAL CASTINGS

Length—When width exceeds 24", length must not exceed 7' 0". Under 24" width the length must not exceed 9' 0", except in  $\frac{5}{16}$ " iron which must not exceed 7' 0".

Thickness	Maximum Allowable Surface Width		
	Iron	Bronze	Aluminum
$\frac{1}{8}$ "	Not made	Up to 6"	Up to 14"
$\frac{3}{16}$ "	Up to 6"	" " 12"	" " 30"
$\frac{1}{2}$ "	" " 12"	" " 18"	" " 36"
$\frac{3}{4}$ "	" " 24"	" " 24"	" " 44"
$\frac{7}{8}$ "	" " 32"	" " 30"	" " 48"
$\frac{1}{2}$ "	" " 44"	" " 44"	" " 48"
$\frac{3}{4}$ "	" " 48"	" " 48"	" " 48"

#### Standard Surfaces

Plain, Hatched, Grooved—These three surfaces, illustrated at left, are common to all makes of abrasive metal and are furnished in various forms in cast iron, bronze, nickel and aluminum.

#### Special Surfaces

To meet the demand for still more desirable anti-slip quality, and to provide certain characteristics not obtainable in the common or Standard Surfaces of the "Safe Tread" and other makes of abrasive metals, two special surfaces known as "Duo-Plane" and "Sovac" have been developed. After service tests of several years under severest conditions they are recommended as the best available materials for their respective purposes.

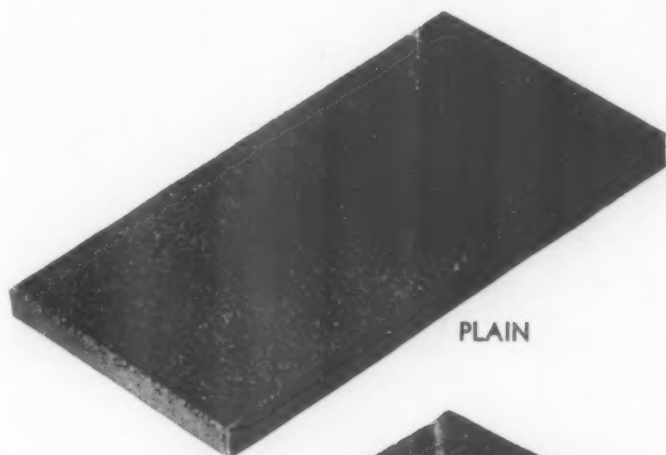
Plain, Hatched and Duo-Plane surfaces are preferable for stair treads, nosings, platforms, etc., where grooves parallel to the edge would be a hazard. The grooved surface is used mostly for door saddles of various types.

#### "Duo-Plane"

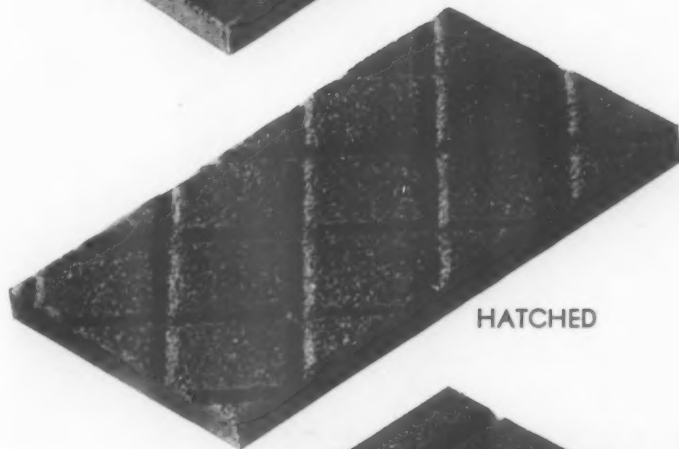
The "Duo-Plane" Safe Tread embodies a new principle by providing an upper or initial contact plane composed of the tops of squares (b.b.) about  $\frac{3}{4}$  x  $\frac{3}{4}$  in. separated by rectangular section valleys about  $\frac{1}{8}$  in. deep and  $\frac{1}{2}$  in. wide. Abrasive grains (d.d. and e.e.) are embedded at the time of casting, in both the squares and bottoms of the valleys to a depth of about  $\frac{1}{2}$  in. in each. When elevations are worn down, contact begins on anti-slip surfaces at bottoms of the valleys, thus providing double life. (In Standard Surfaces there is only one wearing plane thickness of abrasive.) This type is especially desirable for maximum durability and effectiveness. Cast in iron in practically any form to meet specific requirements.



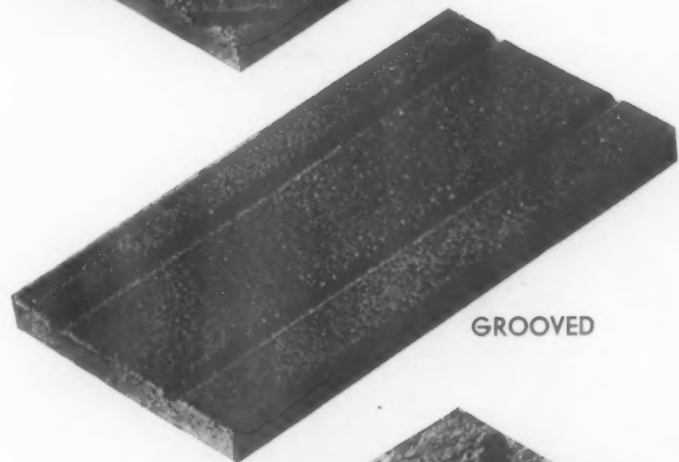
Cross Section of "Duo-Plane Safe Tread"



PLAIN



HATCHED



GROOVED



"DUO-PLANE"

"SOVAC"  
(See page 4)

## "SOVAC"

"Sovac" is a surface of great durability and effectiveness, that will not "clog-up" under grease, oil, mud, dust, etc. "Sovac" Safe Tread was developed through the combined efforts of *safety engineers* in the oil industry and THE SAFE TREAD COMPANY, INC.

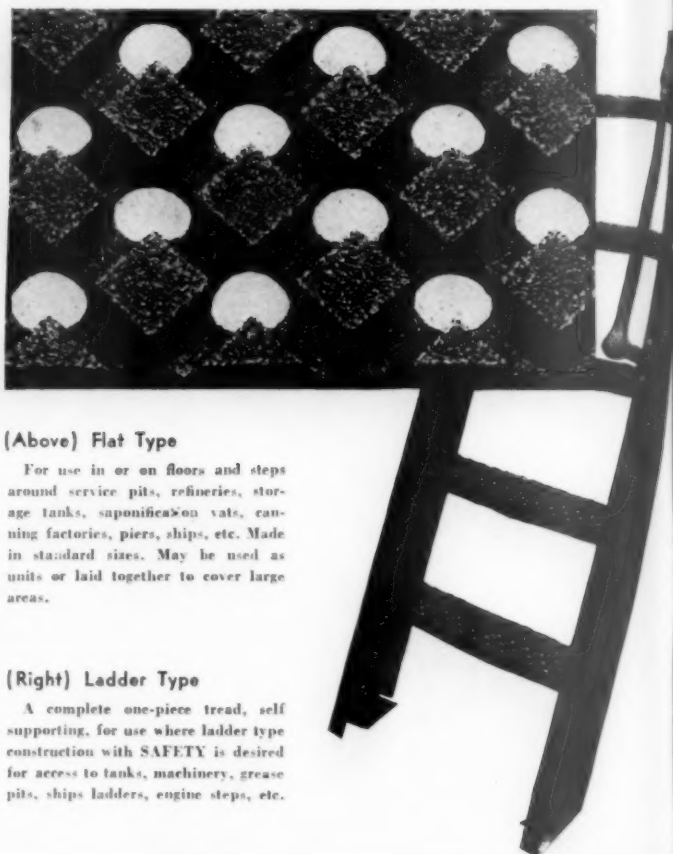
Features are:

- (1) Diamond-hard abrasive surface is actually non-slip and extremely resistant to wear.
- (2) Deep, wide, cross-hatched grooves take dirt and muck that would otherwise clog up walking surface.
- (3) Diagonal grooves, facilitate cleaning.
- (4) Large holes at groove intersection make treads actually self-cleaning when supported on angle irons or grating; or as a self-supporting "structural" tread.
- (5) Made only of cast iron with aluminum oxide abrasive grains embedded in wearing surface, it is not susceptible to corrosive action of weather, acid fumes, or oil.

"SOVAC" STANDARD SIZES

Length	Width		Length	Width	
	Flat Tread	Ladder Tread		Flat Tread	Ladder Tread
24"	3", 4 1/2", 6", 7 1/2"	4 1/2", 6", 7 1/2"	36"	6", 7 1/2", 12"	6", 7 1/2"
30"	3", 4 1/2", 6", 7 1/2"	4 1/2", 6", 7 1/2"	48"		

Note: Patterns or stock of above sizes insure prompt delivery. Customer standards developed for special use will include additional pattern charge and longer time for delivery.



(Above) Flat Type

For use in or on floors and steps around service pits, refineries, storage tanks, saponification vats, canning factories, piers, ships, etc. Made in standard sizes. May be used as units or laid together to cover large areas.

(Right) Ladder Type

A complete one-piece tread, self supporting, for use where ladder type construction with SAFETY is desired for access to tanks, machinery, grease pits, ships ladders, engine steps, etc.

## abrasive plastic treads

"Safe Tread" Abrasive Plastic Tread is a plastic-abrasive filled, fabricated galvanized form.

The filler is abrasive, bonded with a synthetic resin, rolled under heavy pressure into the tread and baked at high temperature.

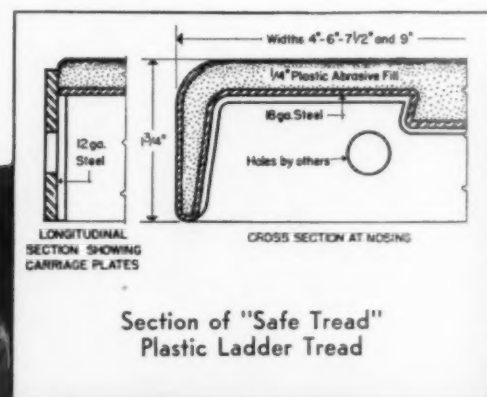
They are exceptionally light-weight structural treads, unaffected by salt water, oils, dilute acids, etc., and are extremely strong, carrying a center load of 1200 lbs. on a 24 in. span.

Developed primarily for U. S. Navy use as a substitute for previous standard type and found to be stronger, lighter in weight and more economical.

Furnished only in standard sizes—

Widths: 4, 6, 7 1/2 and 9 inches

Lengths: 18, 20, 24 and 26 inches

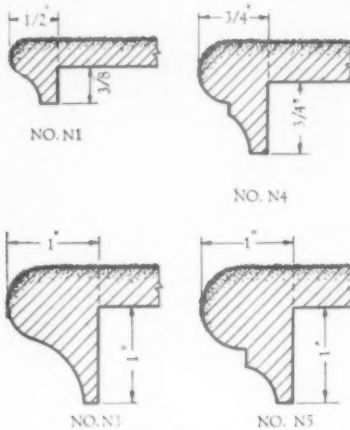


Section of "Safe Tread" Plastic Ladder Tread

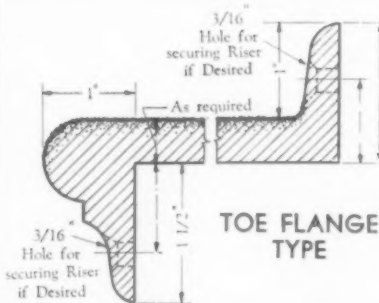


## "SAFE TREAD" Standard Forms

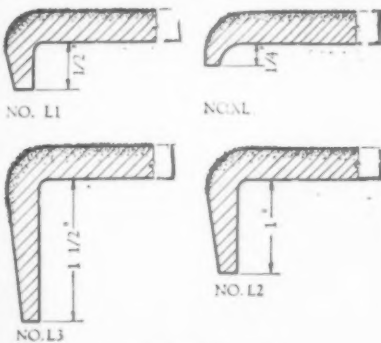
The following details are suggestive of the many forms in which "Safe Tread" Abrasive Metals are available. They can be cast in practically any form to meet specific requirements. Minimum thickness:  $\frac{5}{16}$  in. for Iron;  $\frac{1}{4}$  in. for Bronze and Aluminum.



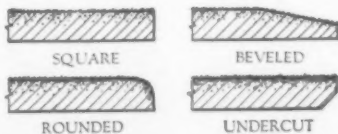
**STANDARD NOSINGS**  
Other types are available.



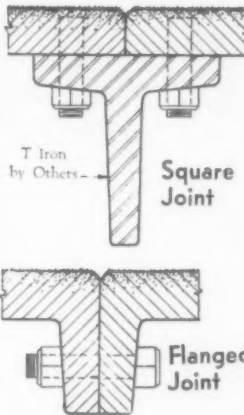
**TOE FLANGE TYPE**



**STANDARD LIPS**

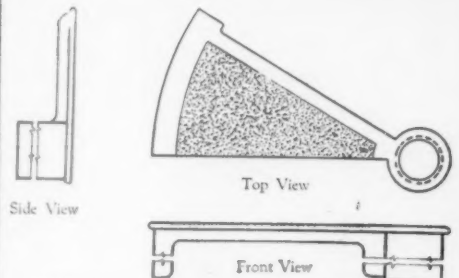


**STANDARD ENDS AND EDGES**  
Used with any type nosing or lip.



### SECTION JOINTS

When areas such as stair platforms are too large for casting in one piece sections of suitable size are cast with either flanged or square ground joints, as specified.



### SPIRAL TREADS AND LANDINGS

The abrasive top surface of "Safe Tread" spirals and landings makes possible the safe use of an otherwise dangerous type of stair. Made in standard sizes only, with collars for 3 1/2" pipe; 12 to 16 per circle, 18", 21" and 24" to 36" radius (in increments of 1"), with circular or square landings.



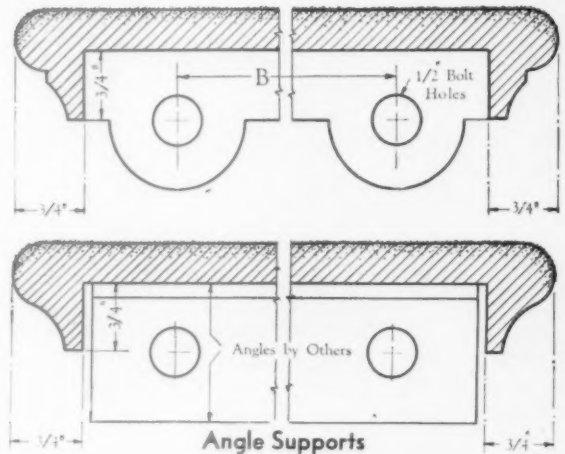
Reinforcing Rib Used When Necessary With Structural Treads

Standard Spacing (Inches)

W	5	6	7	8	9	10
B	2	3	3 1/2	4	5	6

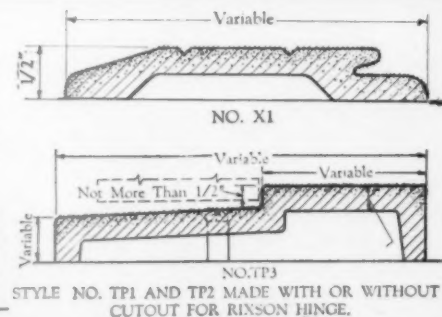
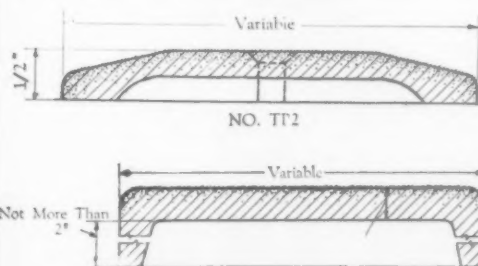
### ANGLE SUPPORTS

The usual supports for ends of structural stair treads are angles fabricated with the iron work. When desired, treads with end lugs or box flanges are cast as part of tread, in which case holes for 1/2" bolts are cored on standard spacing shown above.



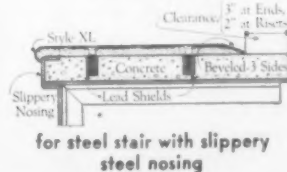
**Angle Supports**

### THRESHOLDS AND SADDLES

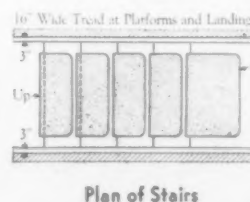


STYLE NO. TP1 AND TP2 MADE WITH OR WITHOUT CUTOUT FOR RIXSON HINGE.

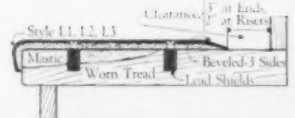
### APPROVED METHODS OF REPAIR:



for steel stair with slippery steel nosing

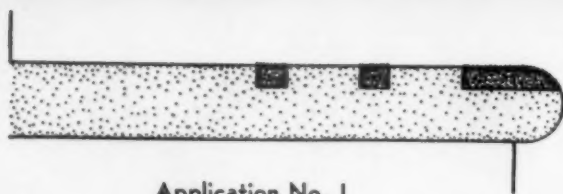


Plan of Stairs

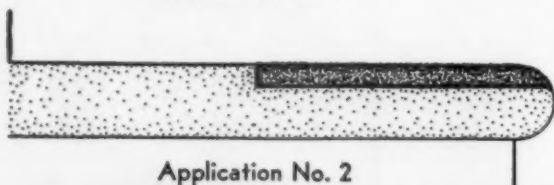


for worn wood, slate, marble, etc., treads

## abrasive plastic filler or surfacer



Application No. 1

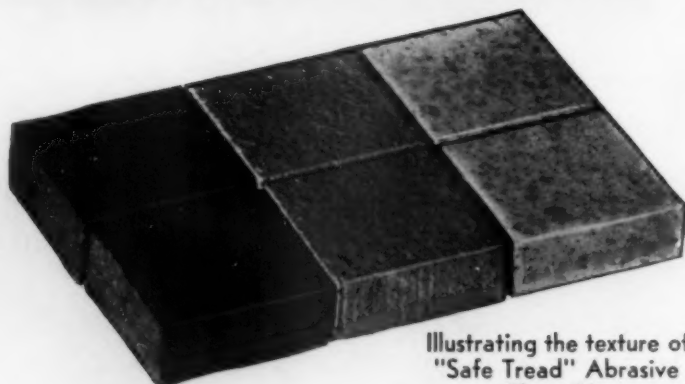


Application No. 2

"Safe Tread" Abrasive Plastic Filler or Surfacers provides protection against slipping and wear in places where other forms are not so well adapted for architectural and other considerations.

As shown in the accompanying illustrations, this abrasive plastic is applied in grooves cut in marble, terrazzo on other stone treads, either new or

## abrasive tile



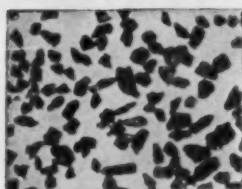
Illustrating the texture of "Safe Tread" Abrasive Floor Tile

"Safe Tread" Abrasive Tile are vitrified ceramics with abrasive content, non-porous, fast colored, and effectively anti-slip.

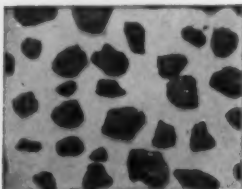
Because of their decorative, as well as anti-slip qualities, "Safe Tread" Abrasive Tile are especially adaptable for use on the walkways of public and private indoor swimming pools, and hotel and institutional kitchen floors; also used extensively for store entrance floors, vestibule floors in office buildings, hotels, apartment houses, etc.

Colors—Black, Green, Blue, Red, Brown, Gray, White, Yellow, Tan.

## abrasive aggregates



12-30 Mesh



6-12 Mesh

Full size of two abrasive aggregates



Troweling "Safe Tread" Abrasive Aggregates into New Cement Floor

### "Safe Tread" Terrazzo Aggregates

For use in Terrazzo, pre-cast stone, and other composition floors where fast colors are desired and a non-porous and anti-slip element is essential for Safety and Sanitation.

These are the only aggregates manufactured as individual granules, formed before firing. Being approximately spherical or cube-shaped, they provide maximum surface for cement adherence. Being vitrified ceramic with abrasive content, they are anti-slip, non-porous and fast colored, stronger, harder and more durable than any crushed natural or synthetic aggregate.

Furnished in colors and sizes to meet all conditions:

Colors—Black, Dk. Green, Lt. Green, Lt. Gray, Sangrey, White Granite, Cream, Yellow, Buff, White, Dk. Blue, Pink, Tan, Red, Chocolate.

Sizes—(Standard) Nos. 00, 0, 1, 2 and 3. (Special) No. 000 and No. 0000.

slightly worn (Application No. 1), or on entire or desired areas of any slippery new or even badly worn tread surfaces (Application No. 2), to any of which it bonds solidly and firmly.

Furnished in 1 and 5 gal. containers. Can be applied by trowel, or spray gun for large floor areas.



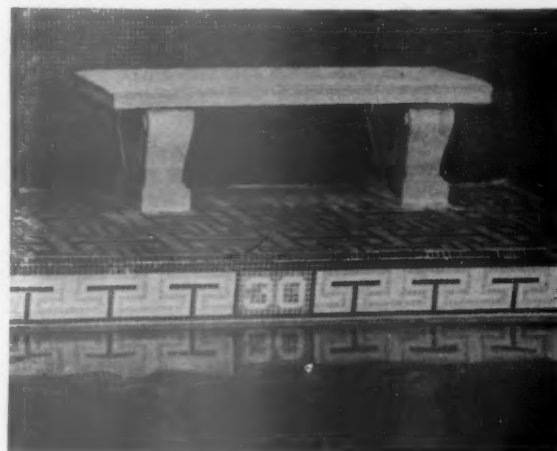
"Safe Tread" Abrasive Plastic Filler Applied to Pre-Cast Terrazzo Treads

### Sizes and Types

FLOOR TILE		STAIR TILE
Small Sizes	Large Units	
$3\frac{1}{4}" \times 3\frac{1}{4}"$	$4\frac{1}{4} \times 4\frac{1}{4} \times \frac{3}{16}$	$6 \times 4 \times \frac{1}{2}$
1" Hex	$6 \times 3 \times \frac{1}{2}$	$6 \times 4 \times \frac{3}{4}$
$1\frac{1}{4}"$ Hex	$6 \times 6 \times \frac{1}{2}$	$6 \times 6 \times \frac{1}{2}$
$1\frac{1}{8}" \times 2\frac{5}{16}"$	$6 \times 3 \times \frac{3}{4}$	$6 \times 6 \times \frac{3}{4}$
$2\frac{5}{16}" \times 2\frac{5}{16}"$	$6 \times 6 \times \frac{3}{4}$	$7 \times 7 \times \frac{3}{4}$
2" Hex	$7 \times 3\frac{1}{2} \times \frac{3}{4}$	$9 \times 4 \times \frac{3}{4}$
3" Hex	$12 \times 6 \times 1$	$9 \times 6 \times \frac{3}{4}$
	$12 \times 12 \times 1$	$12 \times 12 \times 1\frac{1}{4}$
	$12 \times 6 \times 1\frac{1}{4}$	
	$12 \times 12 \times 1\frac{1}{4}$	

NOTE:—Floor Tile in small sizes are furnished mounted or in bulk. All edges square.

Stair Tile have one long edge rounded to  $\frac{1}{4}"$  radius.



Showing One of Many Uses for "Safe Tread" Anti-slip Abrasive Tile

### "Safe Tread" Abrasive Aggregates

For cement finish floor surface.

These aggregates are crystalline aluminum oxide, produced by electrical fusion, crushed and screened to desired size, excelled in hardness only by the diamond.

They are troweled or floated into cement finish floors to provide an effective and more durable anti-slip walking surface. Sizes 6-12, 12-20.

### "Safe Tread" Crushed Emery Rock

For cement floors.

Highly resistant to acid action, provides an anti-slip element and is much more durable than crushed trap rock, limestone, etc., under abrasive service conditions.



"Safe Tread" Abrasive Aggregates in Station Platforms of New York Subways (Iron "Safe Treads" in Steps)



# "SAFE TREAD"

• for enduring underfoot safety



Photo—McLaughlin Air Service

"PARKCHESTER"—the housing development by the Metropolitan Life Insurance Co.

*Builders: Starrett Bros. & Eken, Inc.*

Stair treads and intermediate platforms (over 60,000) are "Safe Tread" abrasive iron, Type "C."

## THE SAFE TREAD CO., INC.

30 Vesey Street . . . New York, N. Y.

Branch Sales Offices in Principal Cities

# AMERICAN ABRASIVE METALS CO.

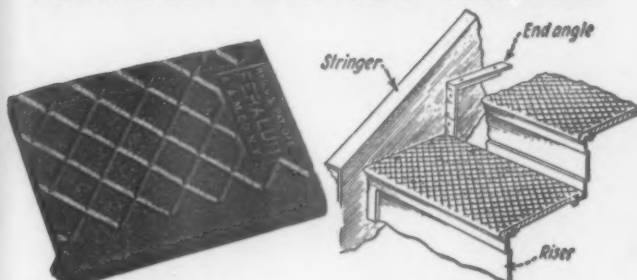
IRVINGTON, N. J.

Offices in Principal Cities

ANTI-SLIP PRODUCTS FOR FLOORS, STAIRS, RAMPS AND WALKWAYS

## FERALUN ANTI-SLIP TREADS

## MARTEX NON-SKID



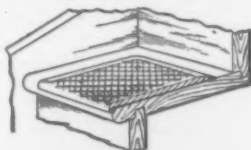
Feralun is available in hatched, plain or fluted surfaces

Especially designed for school installation

Feralun is cast metal with abrasive particles of near-diamond hardness imbedded in the surface. Particles give perfect grip to wet or dry soles. Feralun Treads require no maintenance and usually last the life of a school. Feralun is made in many types for stair treads, floor plates and door saddles. Write for further information giving details of your needs.



Style A—Long lip for worn wood or marble treads. Maximum depth of lip 2" from underside of tread



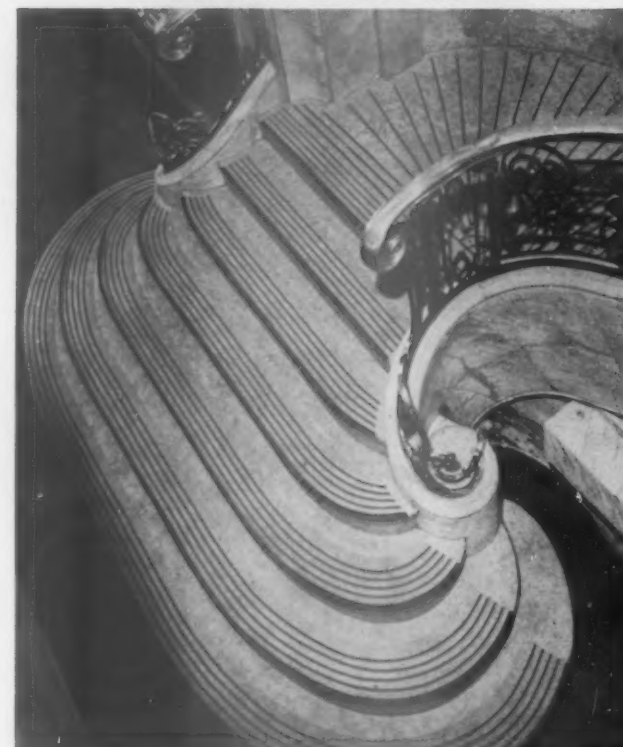
Style A—For new or slightly worn surfaces

## FERA-FLOW NON-SLIP FLOOR PAINT



etc. It is available in colors: Grey, Green and Red.

A quick, low-cost method of slip-proofing walkways is to paint with Fera-Flow. This product is a high-grade floor paint containing non-slip particles. It provides all the protective qualities of good paint and is non-slip wet, oily or dry. Fera-Flow will out-wear the ordinary painted surface and is just as easy to clean. Excellent for shower rooms, manual training rooms, cafeterias,



Martex is a plastic composition having a high percent abrasive aggregate. On new or only slightly worn stairways it is applied in recessed strips along the nosing and tread surface. It provides complete protection against slipping and checks stair wear. Badly worn treads can be restored to original contour with Martex spread over entire worn area. Martex is extremely durable and bonds perfectly to wood, stone, concrete or metal.

Installation of MARTEX



New Stairs



Worn Stairs

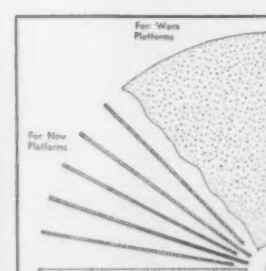


Diagram of sunburst application for platform. Solid coverage for old, worn areas

Granular Fera-Flow surface grips even a wet sole

Conventional floor has a smooth, slippery surface

WE HAVE THE PRODUCT TO CORRECT YOUR SLIPPING HAZARD... WRITE GIVING DETAILS OF YOUR PROBLEM

THE AMERICAN SCHOOL AND UNIVERSITY—1944

# WOOSTER PRODUCTS INC.

Wooster, Ohio

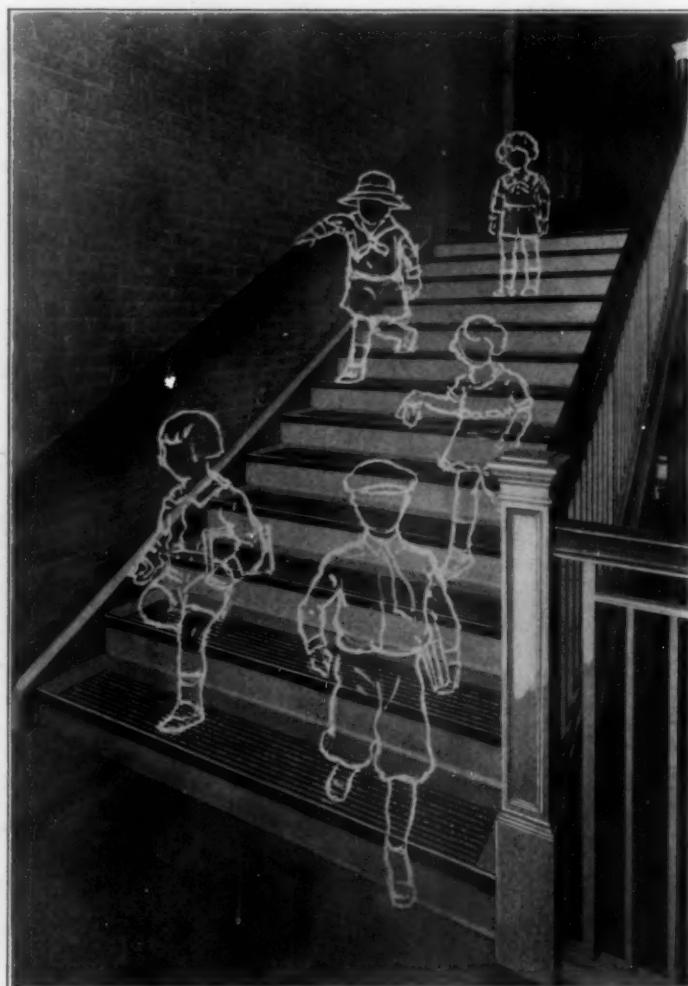
101 PARK AVE.  
NEW YORK

REPRESENTATIVES IN  
ALL PRINCIPAL CITIES

301 SOUTHERN BLDG.  
WASHINGTON, D. C.

## SAFETY TREADS — THRESHOLDS — WINDOW SILLS — CURB BARS

PROTECTION  
FOR THE  
CHILDREN  
IN OUR  
SCHOOLS



ECONOMY  
AND  
PERMANENCE  
FOR THE  
SCHOOL BOARDS

### WOOSTER SAFETY TREADS FURNISH TWO-FOLD PROTECTION

The occupants are protected from accidents due to falls on stairways and the school board is protected from rapid, disfiguring wear.

### WOOSTER TREADS ARE EFFICIENT IN ALL KINDS OF WEATHER

They are not affected by hundreds of wet or snow covered feet.

### SCHOOL STAIRS PROVIDE FIRE ESCAPE AND EMERGENCY EXITS

Make them safe by installing Wooster, long wearing safety treads.



# WOOSTER PRODUCTS INC.

Wooster, Ohio

"FERROGRIT"

"SAFE-GROOVE"

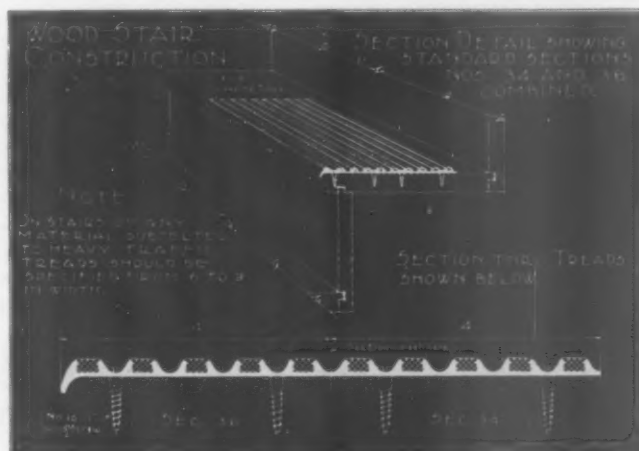
## MAINTENANCE AND REPAIR OF STAIRS

WOOSTER SAFETY TREADS are available for replacing your worn stair treads at minimum cost. They can be applied to wood, slate, concrete or steel pan stairs without the removal of existing construction. WOOSTER SAFE-GROOVE STEEL or ABRASIVE CAST TREADS can be readily installed with screws, expansion bolts or newly developed adhesives. No cutting or recessing of existing treads will be necessary to completely rehabilitate your stairways with maintenance free safety treads.

★

SAFETY TREADS CAN BE INSTALLED WITHOUT CLOSING STAIRWAY. SEMI-SKILLED LABOR CAN BE USED TO OBTAIN MAXIMUM SAFETY AT MINIMUM COST. NO CUTTING OF WOOD TREADS IS REQUIRED

★



STANDARDS ARE  
AVAILABLE  
UPON REQUEST

- TYPE 100 — PLATE 1
- TYPE 101 — PLATE 2
- TYPE 102 — PLATE 3
- TYPE 103 — PLATE 4
- TYPE 104 — PLATE 5
- TYPE 105 — PLATE 6
- TYPE 109 — PLATE 11
- TYPE 110 — PLATE 1
- TYPE 111 — PLATE 12
- TYPE 112 — PLATE 13
- TYPE 113 — PLATE 14
- TYPE 114 — PLATE 15
- TYPE 115 — PLATE 16
- TYPE 115 — PLATE 17
- S.A. DOOR THRESHOLD
- TYPE 115 — PLATE 18
- D.A. DOOR THRESHOLD
- TYPE 116 — PLATE 19
- TYPE 117 — PLATE 20
- TYPE 119 — PLATE 21
- TYPE 120 — PLATE 1
- TYPE 121 — PLATE 1
- TYPE 401 — PLATE 22
- TYPE 402 — PLATE 23

## WOOSTER CAST WINDOW SILLS

Wooster Cast Iron Window Sills provide a sill construction for windows of all types that will be attractive in appearance, cut down construction costs, speed up masonry work and eliminate maintenance.

It furnishes a self-flashing, weathertight sill construction at minimum cost. Cast from pearlitic gray iron of low sulphur content, it has unusually high corrosion resisting qualities, thus reducing tendency to stain masonry below sill line. They reduce complaints on leakage and cut caulking costs. Require no shimming or blocking.

## WOOSTER NON-SLIP CURB BARS

Wooster Cast Iron Abrasive Curb Bar provides a new safety feature to eliminate accidents to pedestrians caused by inadequate curb protection. These bars will materially reduce accidents at school crossings and curbs around campus.

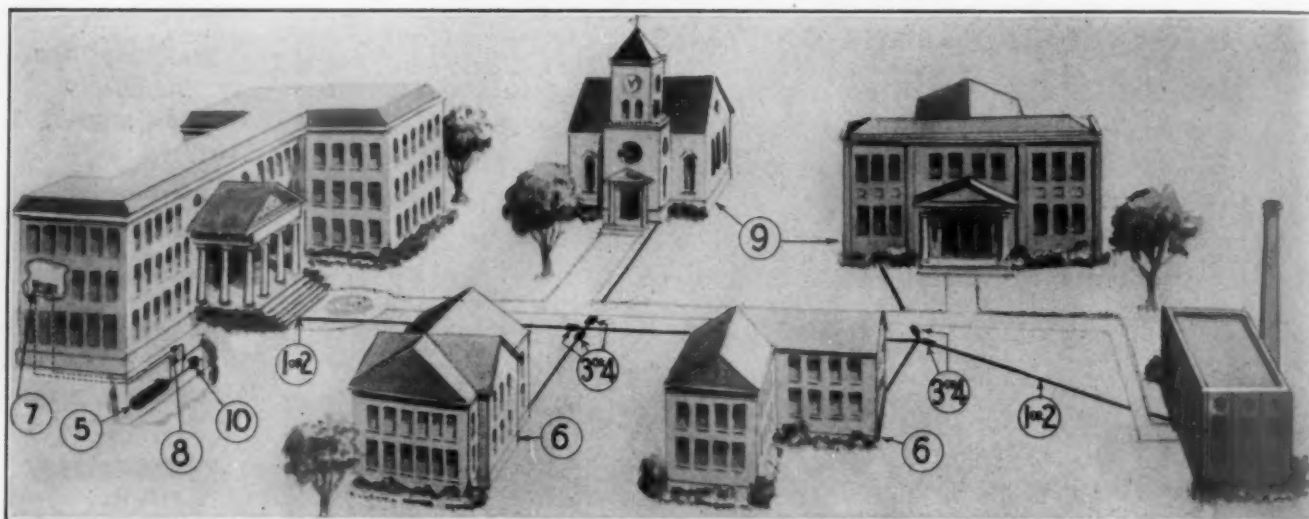
# AMERICAN DISTRICT STEAM COMPANY

IN BUSINESS  
OVER  
SIXTY YEARS

Manufacturers of District Steam Heating Equipment  
and ADSCO Water Heaters

North Tonawanda, N. Y.

BRANCHES AND  
AGENTS  
IN PRINCIPAL CITIES



① RED DIAMOND WOOD CASING	③ ADSCO SLIP TYPE EXPANSION JOINT	⑤ STORAGE TYPE WATER HEATER	⑦ RADIATOR VALVES	⑨ REDUCING VALVES
② ADSCO-BANNON TILE CONDUIT	④ ADSCO PACKLESS EXPANSION JOINT	⑥ INSTANTANEOUS WATER HEATER	⑧ VERTICAL STEAM TRAP	⑩ ROTARY CONDEN- SATION METER

## ADSCO PRODUCTS Assure Dependable Heating Efficiency for Campus Steam Distribution Line Extensions or Replacements

### Specified by Architects and Engineers

When planning new college buildings to be heated by an underground steam line extension from a central heating plant, many college architects and engineers take their specifications for the mechanical equipment from the ADSCO Catalog No. 35. It gives complete information from a single book on ADSCO Slip and Packless Types of Expansion Joints, ADSCO-Bannon Tile Conduit or Wood Casing for underground steam lines, Condensation Meters, Water Heaters, Pipe Supports, Steam Traps, etc. Send for your copy today.

### Approved by Superintendents of Buildings

Superintendents of college buildings, responsible for the efficient operation of mechanical equipment costing thousands of dollars, approve ADSCO Products for steam distribution based on many years of favorable operating experience with ADSCO equipment. To them, an ADSCO specification means assured operating efficiency with a minimum of maintenance.

When new or replacement equipment is required they consult the ADSCO Catalog No. 35 first when requisitioning or purchasing steam distribution equipment.

### Purchased by College Business Managers

College business managers and purchasing agents buy ADSCO Products with confidence for their campus steam distribution lines.

When new expansion joints, tile conduit, wood casing, condensation meters, water heaters, steam traps, radiator valves or other equipment is required, the first buying source is ADSCO to secure dependable products, reasonably priced with prompt delivery assured.

The ADSCO Catalog No. 35 illustrating and describing our equipment should be on every business manager's desk. If you do not have one, please request your copy promptly.

### PARTIAL LIST OF USERS OF ADSCO PRODUCTS IN THE SCHOOL AND UNIVERSITY FIELD

Alfred University	Harvard University	Pennsylvania State College	University of Dayton	University of Texas
American University	Howard University	St. Bonaventure College	University of Florida	University of Toronto
Arkansas State College	Iowa State Teachers College	State College of Wash.	University of Maryland	University of W. Virginia
Barnard College	Juniata College	State Univ. of Iowa	University of Minnesota	University of Wisconsin
Bucknell University	Louisiana State University	Syracuse University	University of Montana	University of Wyoming
Carleton College	Michigan State College	Temple University	University of North Carolina	University of Utah
Columbia University	Middlebury College	Tufts College	University of Pittsburgh	Vassar College
Cornell University	Monmouth College	Union College	University of Rochester	Wellesley College
Dartmouth College	Pa. State Teachers College	University of Arizona	University of Tennessee	Williams College

# JOHNSON SERVICE COMPANY

Milwaukee 2, Wisconsin

BRANCHES IN ALL PRINCIPAL CITIES

TEMPERATURE CONTROL EQUIPMENT

*by*

# JOHNSON

*for MODERN SCHOOLS  
and College Buildings*

**T**HERE are three general methods of heating and ventilating modern school buildings. In order that all the elements which enter into these systems may be correlated properly and function in correct sequence, it is essential that a complete, unified system of automatic temperature control be installed, as developed by Johnson. No unrelated collection of devices sold "over the counter" and installed by mechanics not familiar with the type of work, will give satisfaction.

## 1. THE COMBINATION OR "SPLIT" SYSTEM

Heating consists of direct radiators, generally of sufficient size to offset the heat loss from the exposed wall and glass surface. Ventilation requirements are met by indirect radiation of sufficient capacity to warm the air, which is delivered by the duct system.

## 2. "UNIT" SYSTEM

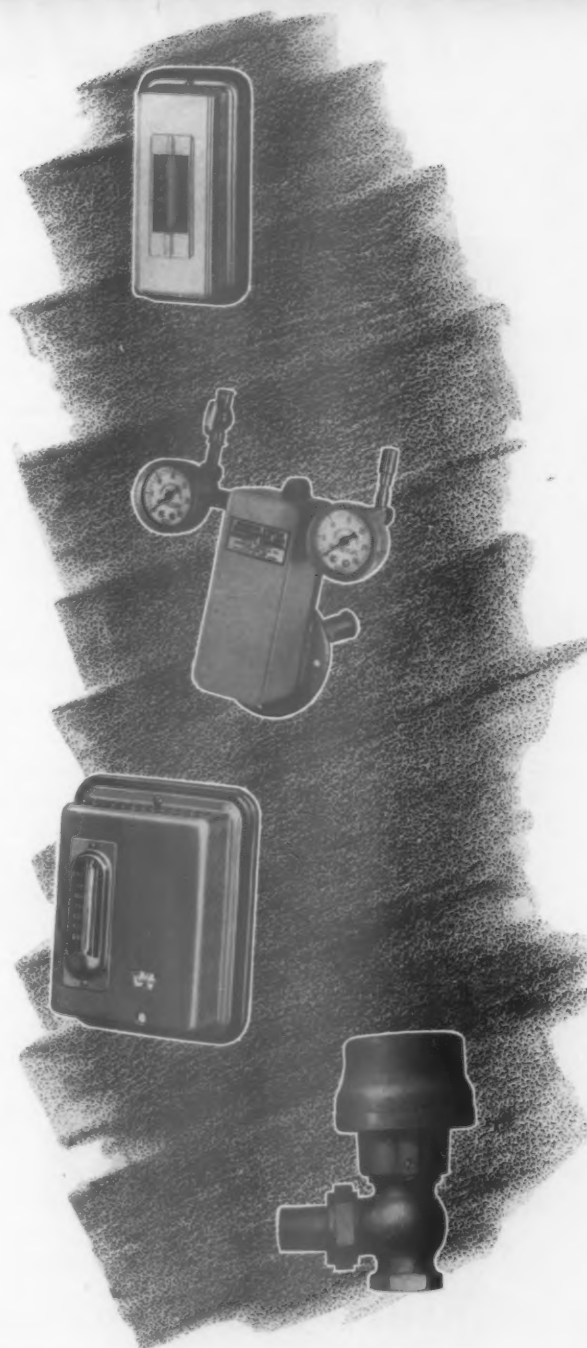
Direct radiators partially offset the heat loss from the exposed wall and glass surface, and an indirect radiator in the unit ventilating machine furnishes the additional heat necessary and provides for ventilation requirements.

## 3. BLAST OR "INDIRECT" SYSTEM

A mixture of outdoor and return air is drawn into the combined heating and ventilating system and then forced through automatically controlled heating coils or tempered air by-pass into warm and tempered air chambers. Double Mixing Dampers in the individual duct to each room are controlled by a room thermostat, insuring the proper temperature for each space.

All of the requirements for automatic control of these systems have been carefully worked out by Johnson. Write for booklet with detailed descriptions and illustrations of the three methods of heating and ventilation in modern schools.

THE AMERICAN SCHOOL AND UNIVERSITY—1944





# THE HERMAN NELSON CORPORATION

Moline, Illinois

AUTOVENT FAN AND BLOWER DIVISION, CHICAGO, ILLINOIS

SALES AND SERVICE OFFICES IN PRINCIPAL CITIES



## *Herman Nelson*



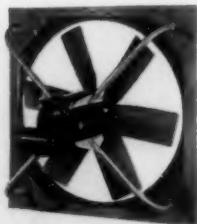
**Herman Nelson  
Unit Ventilator**

*for better heating and  
ventilating equipment*

**H**ERMAN NELSON UNIT VENTILATORS are designed and constructed to maintain proper air conditions in crowded spaces where occupancy makes necessary the introduction of outdoor air to properly control temperatures. This unit consists of an attractive cabinet containing fan and motor assembly, heating element, filter and dampers, all designed and constructed in such a manner as to most efficiently and quietly maintain proper air conditions in such spaces.

The Herman Nelson Unit Ventilator is made in two sizes of a small unit to be placed in the room to be ventilated, with air deliveries from 1,000 to 1,560 c.f.m. and in four sizes of a larger unit to be placed outside of the room to be ventilated, having air delivery capacities of from 3,000 to 10,000 c.f.m. Complete engineering data is available upon request.

The complete line of Herman Nelson Products makes it possible to select the correct equipment to solve any school heating or ventilating problem.



**Autovent Direct  
Drive Propeller Fan**



**Autovent Type HB  
Heavy Duty Blower**



**Herman Nelson  
hiJet Unit Heater**

**MANUFACTURERS OF QUALITY HEATING, VENTILATING AND AIR CONDITIONING PRODUCTS**

**THE AMERICAN SCHOOL AND UNIVERSITY—1944**

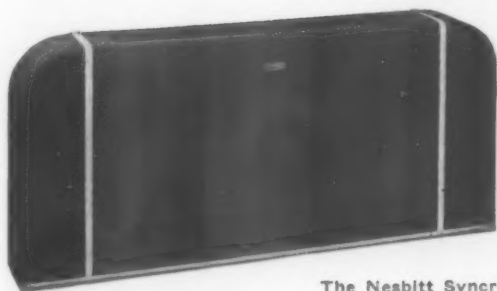
# JOHN J. NESBITT, INC.

*Manufacturers of*

**Heating, Ventilating and Air Conditioning Equipment**

Holmesburg, Philadelphia 36, Pa.

11 Park Place, New York 7, N. Y.



The Nesbitt Syncretizer

RESULT of years of scientific research and progress, the Nesbitt Syncretizer represents the most advanced thought on heating and ventilating the schoolroom. It brings in and distributes to the classroom a continuous supply of fresh, outdoor air, and "syncretizes" (or harmonizes) it with room air so as to maintain a healthful, comfortable June-like condition, even when the outside temperature is below zero.

## DRAFTLESS FRESH AIR WITHOUT OVERHEATING



tained without permitting overheating.

The Nesbitt Syncretizer prevents drafts, overheating and unpleasant odors. It is adjustable according to any State's laws to deliver all or part outdoor air, but always some outdoor air to occupied classrooms. Its special Air-Stream Minimum Temperature Control provides that all air taken from outdoors is first warmed to a safe minimum temperature, thus preventing drafts. The Room Temperature Control assures that the desired room temperature will be uniformly main-

## BEAUTY AND PERFORMANCE

The Syncretizer's simple beauty is conformable to school-room needs; it is attractive but not obtrusive. Tests have proved it to be the quietest of units. Its quietness is achieved by the exclusive Nesbitt combination of four silent-type fans, perfectly balanced on a "floating" shaft, rotated by the quietest motor obtainable, the whole action hushed by an insulated casing. Its economy of fuel and current wins lasting favor. In competitive demonstrations before school boards, the Nesbitt Syncretizer has outsold all other unit ventilators.

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## Today's Most Healthful Heating and Ventilating for the New or Remodeled School Building

### MODERN STREAMLINING

Neat, convenient storage shelves integrated with heating and ventilating units can bring a streamlined appearance to a cluttered classroom; they provide adequate storage facilities for the projects and materials that are a necessary part of today's curriculum. Nesbitts now furnish their Syncretizers and auxiliary convectors in special casings when desired for combining pleasingly with standard or specially built storage units.



Unit Casings to fit with Storage Units modernize the classroom and encourage the habit of neatness.

### SERIES B THERMOVENTS

For heating and ventilating auditoriums, gymnasiums, assembly halls and similar gathering places there are the Nesbitt Series B Thermovents. Publication 227-1.



To the men and women of John J. Nesbitt, Inc. has come the highest industrial honor—the Army-Navy "E" Award.

# NESBITT Syncretized Air

### "THE GUARDIAN OF SCHOOLROOM HEALTH"

Nesbitt Syncretizers are sold by American Blower Corporation and John J. Nesbitt, Inc. Complete information is contained in Publication 231. For engineering data, Publication 225-1.

# STREAMLINE PIPE AND FITTINGS DIVISION

MUELLER BRASS CO.

Port Huron, Michigan

## PROTECT THE INVESTMENT FOR THE LIFE OF THE BUILDING BY INSTALLING STREAMLINE COPPER PIPE FOR THE PLUMBING AND HEATING SYSTEMS

STREAMLINE bronze solder fittings and copper pipe are a radical departure in conducting systems for plumbing, heating or industrial use. Their unique method of connection has made it possible to use copper piping of hard temper and of a sufficient wall thickness to meet all requirements of actual service. This is in direct contrast to threaded copper pipe, which had to carry a very heavy wall to insure a sufficient thickness to meet service conditions after this thickness had been cut away approximately 50% in the fabrication of the thread. Threaded copper pipe for this reason is naturally very expensive and gives no extra service for its additional wall thickness on the unthreaded portion.

STREAMLINE Solder Fittings are manufactured under U. S. Patents 1,770,852; 1,776,502; and 1,890,998



Illustrating Mechanical Features of the STREAMLINE Fitting

THE AMERICAN SCHOOL AND UNIVERSITY—1944

STREAMLINE solder fittings and copper pipe are installed at a price very slightly in advance of rustable materials.

STREAMLINE fittings and copper pipe are ideal for use in all types of educational buildings for all general plumbing and heating purposes: for steam supply, condensate return, cold water, drinking water supply and return, and hot water supply and return piping. Among the many advantages are:

**High resistance to corrosion and clogging**—Under normal conditions of soil and water, copper does not corrode or rust as iron or steel does. The absence of anchor points due to the continuously smooth waterway through pipe and fitting tends greatly to eliminate clogging.

**Light Weight, yet great strength**—The STREAMLINE solder fitting, less heavy and consequently less expensive for any given size, produces a connection that is enormously strong and leakproof.

**Minimum space required**—Although STREAMLINE solder fittings produce enormously strong joints, they are very little larger than the pipe lines which they connect. They do not protrude like screw type fittings. Since these fittings are not screwed into place when connected to the pipe and no space is required for wrench handling, etc., they can be installed very close to each other, thus saving considerable space.

**Leaks due to vibration eliminated**—Constant vibration has no effect on a joint made with STREAMLINE solder fittings. Its effects are not localized as is the case with screw type fittings, but are harmlessly dissipated throughout the system.

**Visual proof an exclusive feature of the STREAMLINE Fitting**—When the mechanic installs STREAMLINE he can tell at a glance that the joint he has made is permanently leakproof without an actual pressure test. This is a valuable asset especially in concealed work.



The STREAMLINE solder fitting is not connected by threading or flaring but by soldering, utilizing one of nature's laws—capillary attraction—to form a permanently tight joint of great strength. The joint, in contrast to threaded connections, is actually reinforced and is the strongest point in the line, instead of the weakest.



Cut-away Sectional View of STREAMLINE Tee. Note How Pipe Is Recessed Into the Fitting, Resulting in a Uniform Smooth Waterway

The illustration herewith shows the mechanical features of the STREAMLINE solder fitting. After the joint has been fluxed and assembled in the pipe, it is heated and solder introduced through the feed hole. Capillary

ity immediately distributes it thoroughly and evenly between the bonding surfaces, producing a joint so strong that in a pulling test, the pipe will actually break while the joint remains without the slightest damage. It requires over 9000 pounds of pull even before the fracture in the pipe occurs. This, of course, is away beyond anything required of it in actual service.

### ESPECIALLY RECOMMENDED FOR HEATING PLANTS

STREAMLINE hard copper pipe and fittings are particularly recommended for all heating plants—whether by hot water or steam—a special virtue of copper pipe being its capacity to hold heat with a minimum of radiation, yet to conduct it very rapidly, so that there is a minimum loss of heat when being

THE AMERICAN SCHOOL AND UNIVERSITY—1944

conveyed from the point of generation to the points of distribution. Since copper cannot rust, the original delivering capacity of STREAMLINE pipe remains the same indefinitely. In all heating plants, we claim greatly increased benefits in all installations made with STREAMLINE, with noteworthy savings in both fuel and material.

STREAMLINE pipe and fittings are installed in over four hundred schools and colleges throughout the United States and, in fact, in every type of building construction. They have been specified by leading architects everywhere.

STREAMLINE fittings are furnished in complete range from  $\frac{1}{4}$ " to 10".

### COPPER FOR VICTORY

In war, as in peace, copper has advantages that are duplicated by no other metal. Its special properties have made it indispensable for many uses . . . in munitions, ships, trucks, tractors, planes, and other essentials. In the present emergency, every pound available is needed by your Government and the industries manufacturing for war use.

When peace comes and copper has done its part to bring victory, it will again become available for water works and allied uses. It will provide again the longest lived, most economical piping that can be produced.

The word STREAMLINE is the Registered Trade Mark of the Mueller Brass Co., Port Huron, Michigan

Write for Catalog.



Coupling



Tee



Elbow



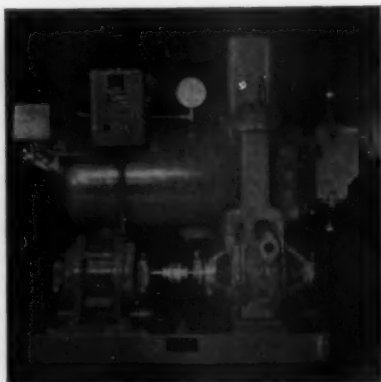
Cross

# THE NASH ENGINEERING COMPANY

222 Wilson Road

South Norwalk, Conn., U. S. A.

SALES AND SERVICE OFFICES IN ALL PRINCIPAL CITIES



## JENNINGS RETURN LINE VACUUM HEATING PUMPS

Standard with the heating industry for over sixteen years. Jennings Pumps remove air and condensation from the return lines of vacuum steam heating systems, discharging the air to atmosphere and returning the water to the boiler.

Two independent pumping units are combined in a single casing—an air unit which handles only air, and a water unit which handles only water. The capacity of each unit is simultaneous capacity. Each handles the full rated capacity independent of the other. Impellers of both are mounted on the same shaft. The pump is bronze fitted throughout.

Supplied either direct connected to standard electric motors, for belt drive, or for steam turbine drive. For continuous or automatic operation against pressures up to 40 lbs. Supplied standard in capacities up to 300,000 sq. ft. E.D.R. Bulletins on request.



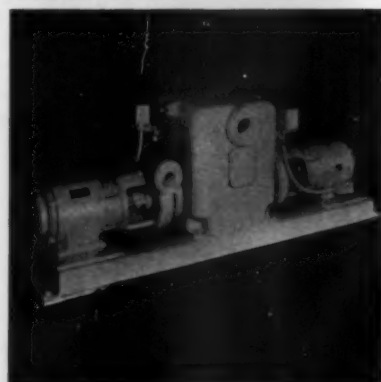
## JENNINGS VAPOR TURBINE VACUUM HEATING PUMPS

The Jennings Vapor Turbine Heating Pump combines all of the advantages of the Standard Jennings Return Line Heating Pumps with a new type of drive, a specially designed low pressure turbine which operates directly on steam from the heating mains on any system, requiring a differential of only 5 in. of mercury, and returns that steam to the heating system with practically no heat loss.

This pump affords the economy which goes with a continuous condensation return and steady vacuum, and at no cost for electric current.

The Jennings Vapor Turbine is a safe heating pump, for it functions as long as there is steam in the system, entirely independent of electric current failure. Ideal for Greenhouse, School, and Hospital service.

Furnished standard in capacities up to 150,000 sq. ft. E.D.R. Bulletin on request.



## JENNINGS CONDENSATION PUMPS

Jennings Condensation Pumps remove condensation from radiators in return line steam heating systems and pump condensation back to the boiler.

Jennings Condensation Pumps are sturdy and compact in construction, and combine receiving tank, pump and driving motor in a single assembly. Bronze fitted throughout, with Tobin bronze shaft. Impeller is of special design adapted to handling hot water with highest efficiency.

They efficiently remove condensation from radiators, particularly those set below the boiler water line level. Pump casing forms part of return tank, making a compact structure that conserves floor space. Rectangular construction permits installation in corner or against wall.

Jennings Condensation Pumps are furnished in standard sizes with capacities ranging from 1½ to 225 g.p.m. of water, for serving from 1,000 to 150,000 sq. ft. equivalent direct radiation. Bulletin on request.



## JENNINGS SUMP AND SEWAGE PUMPS

The Jennings Suction Sump Pump is a self-priming centrifugal pump for handling seepage water and liquids reasonably free from solids. The Suction Sewage Pump is fitted with a non-clog type impeller. Pumps are mounted entirely above the sump where they are always readily accessible. Only the suction pipe is submerged.

There are two moving parts: the centrifugal impeller and the vacuum priming pump rotor. Both rotate without metal-to-metal contact in the casing. Both are mounted on the same shaft that carries the rotor of the electric driving motor, making a compact assembly.

These pumps may be installed away from the pit, or directly over the pit. The Pedestal Type Jennings sets directly on the pit cover, requiring no other foundation.

Capacities and heads to meet all requirements. Bulletins on request.

# PETROLEUM HEAT & POWER COMPANY

Main Office and Factory: Stamford, Conn.

Oil Burning Equipment—"Since 1903"—Fuel Oils



## INDUSTRIAL AND COMMERCIAL OIL BURNING SYSTEMS

"Cut Steam Costs for Schools and Universities"

Automatic boiler operation is the aim of cost-conscious management, but for various sound reasons, it may not be feasible in certain plants. Consequently, Petro burners are available for three general methods of operation:

### AUTOMATIC—SEMI-AUTOMATIC—MANUAL

Petro's operating economies, proved every month in thousands of installations, are due to principles rather than "features" or gadgets. Experience-developed design for specific application, inherent simplicity, and traditionally fine manufacture are basic in Petro burners.

In automatic operation these are enhanced by two important factors in firing efficiency and fuel economy. These are:

#### (1) PETRO'S THERMAL-VISCOSITY CONTROL

—a well proven system for burning No. 6 or Bunker "C" oil at maximum combustion efficiency under absolute control

without any need for frequent manual adjustment—the only method of burning preheated oils which can be called "automatic" legitimately.

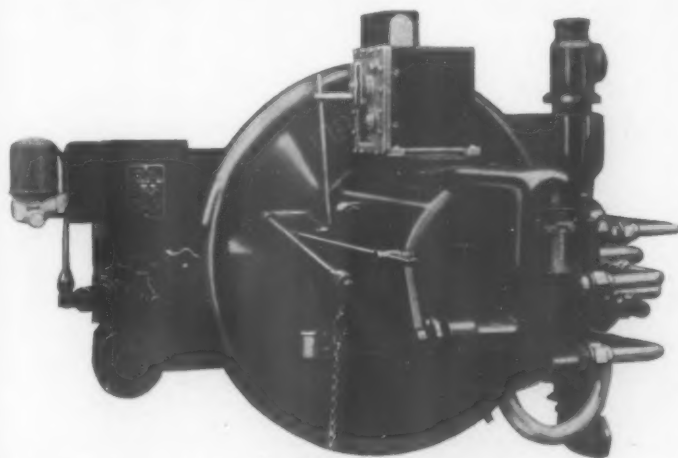
#### (2) MODULATED FUEL CONTROL

—a completely automatic control of high-low operation which permits automatic low fire starting and modulation or acceleration of firing to meet fluctuating steam demands:—maximum combustion efficiency at every stage of firing. Illustration shows modulating motor as mounted on burner (when specified) and arms and linkage through which constant fire-regulation is maintained.

SPECIFYING ENGINEERS will find it helpful to have complete information on these factors which so markedly affect operating costs. Petro Industrial Burner Catalogue may be found in "Sweets," and in "Domestic Engineering" Catalog Files, or copy will be sent gladly on request.

### MODEL W-DIRECT DRIVEN, ROTARY CUP TYPE BURNERS

#### CAPACITIES



Model	Motor H.P.	Max. Gals. Per Hour	Rated Capacity Boiler H.P.	Sq. Ft. C. I. Steam Radiation *
W-2 1/2	1/2	11	34	4,800
W-3	1/2	15	47	6,540
W-4	1/2	25	78	10,825
W-5	1	33	103	14,300
W-6	2	45	141	19,600
W-7	2	62	195	27,150
W-8	3	100	313	43,500
W-9	3	145	454	68,000

W-2 1/2 to W-9 burns No. 5 fuel oil of 300 seconds maximum viscosity at 100° F. Saybolt Universal or any lighter oils without preheating. When heavier No. 5 or No. 6 (Bunker C) fuel oil is used, preheating is required. Models W-2 1/2, 3 and 4 burners, single phase 110 or 220 volt, 50 or 60 cycle. Model W-5 single phase, 220 volt, 50 or 60 cycle.

All models, 220, 440, 550 volt, polyphase, 50 or 60 cycle. W-2 1/2 to W-8 belt driven type is available in 25, 30, and 40 cycle A.C. for all standard voltages, single or polyphase; also 115-230 volt D.C.

(\*) Equivalent Direct Cast Iron Steam Radiation measured at the boiler outlet.

Removable rotary cup and nozzle permits changing shape of flame to suit requirements of any boiler and prevent flame impingement.

Oil pump is a slow speed, permanently packed, self-priming, self-aligning, non-binding or clogging mechanism, assembled as an integral part of burner. Burners also available without integral pump. Motor is cooled by induced circulation of air. Armature shaft is mounted on two deep-groove annular ball bearings. Splash lubrication from the sump which is below the pump drive, lubricates all bearing surfaces in the burner.

This Burner is a self-contained assembly of motor, fan, pump, rotary cup atomizer and all air and oil adjustment apparatus. Illustrated above is a Petro Model W for Automatic operation on No. 6 (Bunker "C") fuel oil.

Interlocking air and oil control mechanism permits any minimum or maximum operation required within the burner's range of operation. Counter-flow Angular Air Vanes at nozzle increase air and oil turbulence and aid efficient combustion of heavy fuel oils.

Special oil adjustment valve meters oil to rotary cup, yet permits manual operation without disturbing permanent burner adjustment.

**WAR NOTE:** While the war lasts Petro equipment can be supplied only on orders supported by the higher urgency rating. In addition to the restrictions on materials, Petro's expanded production capacity is almost totally devoted to ordnance work.

The above data on Petro Industrial Burners is presented for its value in post war planning and is condensed from the complete catalog which will be sent gladly on request.



# THE RIC-WIL COMPANY

## INSULATED PIPE CONDUIT SYSTEMS

Union Commerce Bldg., Cleveland, Ohio

FACTORY: Barberton, Ohio

OFFICES IN PRINCIPAL CITIES

### *Ric-wil offers Conduit for every need—*

**THE MOST COMPLETE LINE—MEETING ALL CONDITIONS OF SERVICE AND COST**  
**THERE IS A RIC-WIL INSULATED CONDUIT SYSTEM ENGINEERED TO THE SPECIFIC NEEDS OF SCHOOLS, UNIVERSITIES AND OTHER INSTITUTIONS FOR THE DISTRIBUTION OF STEAM AND HOT WATER—PROVIDING THE MOST EFFICIENT INSULATION AND PROTECTION**



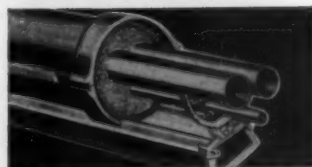
#### **Ric-wil INSULATED PIPE UNIT—SINGLE PIPE SYSTEM**

Prefabricated complete units—pipe as specified, thoroughly insulated, in helical corrugated conduit, coated with asphalt and wrapped in asphalt saturated asbestos felt. All welded construction—pre-sealed in 21 ft. lengths for speedy installation. Filler-type insulation or sectional pipe covering.



#### **Ric-wil INSULATED PIPE UNIT—MULTIPLE PIPE SYSTEM**

Any specified combination of pipes, insulated and protected same as the single pipe system. Any or all of the pipe lines may be specifically insulated.



#### **Ric-wil STANDARD TILE CONDUIT**

Vitrified glazed A.S.T.M. Standard Tile housing—acid- and weatherproof—with foundation type base drain supporting weight of piping through correctly engineered pipe support. For single or multiple pipe system—filler type insulation or sectional pipe covering.



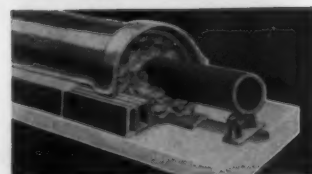
#### **Ric-wil SUPER-TILE CONDUIT**

Same advantages as Standard Tile but with walls approximately double-thick for strength under heavy traffic or where overhead load is above normal. Will support static load of 6 tons per wheel under actual installation conditions. Base drain of extra-heavy tile.



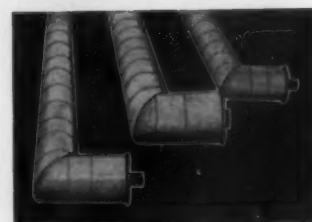
#### **Ric-wil CAST IRON CONDUIT**

Heavy reinforced cast iron conduit for use where underground pipe lines run close to or under railroad tracks. Durable, water tight, vibration-proof, clamps for extra tightness.



#### **Ric-wil TILE CONDUIT—UNIVERSAL TYPE**

Where installation conditions dictate the use of a concrete pad, Ric-wil Universal Tile is recommended. Side walls are double-cell vitrified trapezoidal block design. Arch may be Standard Tile, Super Tile, or Cast Iron.



#### **Ric-wil CONDUIT ACCESSORIES**

Ric-wil accessories are available in all type systems: standard and special fittings, factory-fabricated or field-fabricated expansion devices, alignment guides, anchors, etc.

# TODD SHIPYARDS CORPORATION

(COMBUSTION EQUIPMENT DIVISION)

601 West 26th Street, New York 1, N. Y.

NEW YORK ★ BROOKLYN ★ HOBOKEN ★ BARBER, N. J. ★ SO. PORTLAND, ME.  
GALVESTON ★ HOUSTON ★ MOBILE ★ NEW ORLEANS ★ LOS ANGELES  
S.F. FRANCISCO ★ SEATTLE ★ TACOMA ★ BUENOS AIRES ★ LONDON



## The TODD HEX-PRESS REGISTER in combination with the TODD "VEE-CEE" VARIABLE CAPACITY BURNER

Makes possible increased combustion efficiency under almost any type of boiler of 100 H.P. capacity or larger, operating at 50 pounds steam pressure or higher.

It provides equal efficiency under either forced or natural draft conditions. The Hex-Press Register assures the most intimate mixture of oil and air as well as quicker, more complete combustion . . . with minimum draft loss at high capacity . . . effecting

great economy in maintenance and materially reducing fuel costs.

Through the exclusive "variable range" feature of the "Vee-Cee" Burner, practically unlimited firing range is assured . . . without change of burner tips, oil delivery pressure or angle of spray.

Constant steam pressure can be maintained regardless of demand . . . changing load requirements are met instantly under manual or fully automatic control.

### COMBINATION GAS and OIL BURNERS

For Natural or Refinery Gas and/or Fuel Oil. Available in wide range of capacities. Quickly adjustable for the combustion of either fuel alone, or both in combination. Of special value where fluctuating comparative costs of these fuels call for equipment suited to changeover without time-consuming structural changes.

Maintenance and operation are reduced to a minimum by compactness and simplicity of design . . . accessibility of all parts . . .

rugged construction and positive overall efficiency.

Design features eliminate possibility of escaping gas due to structural distortion . . . prevent stratified combustion resulting from improper air distribution and high gas pressure.

Providing sufficient flexibility to care for varying loads, these units assure high furnace temperature and radiant heat transfer with low stack temperature . . . thorough mixture and optimum air-fuel ratio with utmost ease of adjustment.

### ROTARY FUEL OIL BURNERS

For firing high or low pressure steam or hot water boilers of all types . . . in smaller factories and industrial plants, laundries, dryers and cleaners, office buildings, hotels, apartment houses. Also applicable to industrial ovens, kilns, etc., where furnace and general physical conditions permit.

Available with manual, semi-automatic or fully automatic control . . . in varying sizes and types . . . for burning light or heavy oil.

Horizontal atomizing cup is rotated by direct-con-

nected electric motor, assuring constant firing as long as motor is in operation. Motors are of extra large frame size, air-cooled and built to withstand long, hard service. Positive air-oil interlocking device automatically shuts off oil supply following any burner stoppage.

Of rugged construction . . . with all parts easily accessible for cleaning or renewing . . . these burners provide a flexible capacity range, with complete and efficient combustion under widely fluctuating loads.

**TODD MANUFACTURES:** Mechanical Pressure Atomizing Oil Burners—VEE-CEE Variable Capacity Burners—Horizontal Rotary Oil Burners—Oil Burning Air Registers for Natural, Assisted, Induced or Forced Draft—Inside Mixing Steam Atomizing Oil Burners—Combination Gas and Oil Burners—Furnace Doors and Interior Castings for converting Howden Type Furnace Fronts to oil firing—Oil Burning Galley Ranges—Oil Heating, Pumping and Straining Equipment.



All installations of Todd Equipment are always individually engineered to fulfill specific requirements. Send for descriptive literature.

*Todd engineers are always available for consultation and analysis of combustion problems—without obligation.*

# WARREN WEBSTER & COMPANY

Dept. AU-44

Camden, New Jersey

## Better School Heating

### -Today and Tomorrow

Colleges, schools and other institutional buildings require an economical, controllable heating system that will guarantee prompt heating-up, balanced distribution of steam and even, comfortable temperatures in every room.

The Webster Moderator System of Steam Heating has proved its ability to supply this type of heat in a large number of the finest institutional buildings in America.

With the Webster Moderator System of Steam Heating, there is no waste of valuable fuel through overheating. An Outdoor Thermostat automatically changes the heating rate to agree with changes in outdoor temperatures. Continuous heat flow from every radiator helps maintain comfortable temperatures in every room.



The Webster Outdoor Thermostat automatically changes heating rate when outdoor temperature changes. This device is part of the Webster Moderator System, a central heat control that is saving fuel for hundreds of America's commercial and institutional buildings.

### More Heat with Less Fuel

Actual surveys made by Webster Engineers show that seven out of ten large buildings in America (many less than ten years old) can get up to 33 per cent more heat out of the fuel consumed with the Webster Heating Modernization Program.

School Executives who are planning building construction or modernization both now and after the war will be interested in "Performance Facts". This free booklet contains case studies of 268 modern steam heating installations and the savings possible in dollars and cents with the Webster Moderator System of Steam Heating.

WARREN WEBSTER & Co., Dept. AU-44, Camden, N. J.  
Pioneers of Vacuum Steam heating : : Est. 1888  
Representatives in 60 Principal U. S. Cities



Making Boosters for  
U.S. Army Ordnance

**Webster**  
Steam Heating

### Typical Educational Buildings Equipped with Webster Moderator Systems



Student Union Bldg., of Texas State College for Women, Denton, Texas.



Cloonan Junior High School, Stamford, Conn.



Mineral Industries Bldg., of the West Virginia Univ., Morgantown, W. Va.



## CRANE CO.

Valves, Fittings, Pipe, Plumbing, Heating, Pumps

General Offices: 836 South Michigan Avenue, Chicago 5, Illinois

NATION-WIDE SERVICE THROUGH BRANCHES, WHOLESALERS, PLUMBING AND HEATING CONTRACTORS

### SCHOOL PLUMBING THAT PROTECTS HEALTH WHILE CONSERVING CRITICAL MATERIALS

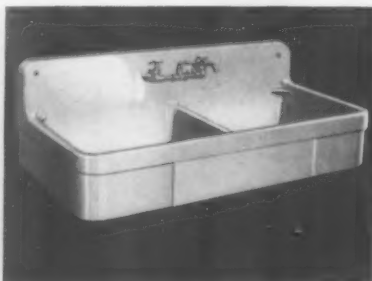
BY combining maximum utility with a minimum use of critical materials, Crane plumbing eliminates the need for compromising with accepted standards of quality and dependability for school service. Fixtures are vitreous china or Crane Duraclay (Vitreous-Glazed), both non-critical materials. Trim is of galvanized iron, minimizing the use of vital metals. Yet, efficiency is not sacrificed as operating parts and valve seats are brass.

Typical items are shown. Your local Plumbing Contractor or Crane Branch will gladly advise you regarding proper selection of equipment for replacement or new installations.

**IMPORTANT**—Educational institutions may automatically apply a priority rating of AA-2 (or allotment symbol "MRO") when ordering plumbing and heating maintenance and repair materials. This is authorized by CMP Reg-5-a. Any Crane branch will be glad to furnish a copy of the official text of this WPB regulation.



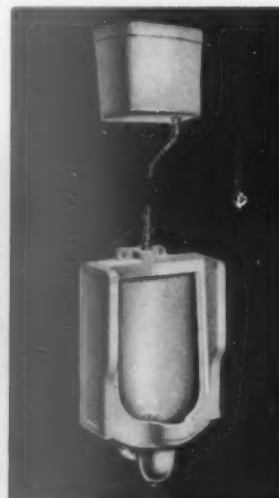
**VICTORY CANTONMENT** vitreous china lavatory with 6-in. back, 14 x 9-in. rectangular basin. Has integral soap depression. Mounts on wall with screws. Size 18 x 15 in. (CE 764)



**COTTAGE DURACLAY** two-compartment apron sink with 6-in. back. Overall dimensions: 42 x 20 in. Basins are 6 in. deep. Fitted with (CE 32-751) galvanized sink fitting with swinging spout, and twin waste with open strainers. Comes with oil-treated hardwood reversible drainboard with cleats. (CE 19-563.)



**RAPIDWAY** blowout wall-type closet with elongated rim, flush valve and vacuum breaker, and with open front plastic seat. (CE 11-380)



**CORRECTO** vitreous china washout trough urinal and tank, complete with galvanized flush pipe and trap. Integral strainer; automatic flushing; 2" female outlet. (CE 15-601)



Galvanized iron exposed 2-valve shower with brass Newsleeve trimming unit and Economy shower head. Has reversible yoke with female union connections for supplies from ceiling or floor. (CE 4418)



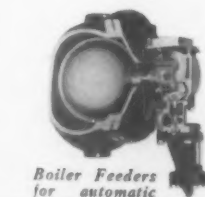
**THURSTEND** vitreous china drinking fountain with integral strainer, Purflo angle stream jet. Has vandal-proof base with regulating screw and self-closing valve. Galvanized iron bracket and trap. (CE 9161)

### HEATING EQUIPMENT FOR REPAIRS AND MAINTENANCE

Crane offers a complete line of improved equipment and specialties for the repair and maintenance of all types of school heating systems. Insure maximum winter comfort for your school with this equipment. Typical items are shown.



Sectional Boilers, up to 3,840,000 Btu. net capacity



Boiler Feeders for automatic and hand-fired systems



Low pressure Pop-Safety Valves for steam boilers



Coal Stokers, from 60 to 350 pounds per hour capacity



Radiator Venting Valves for all type systems

# CRANE

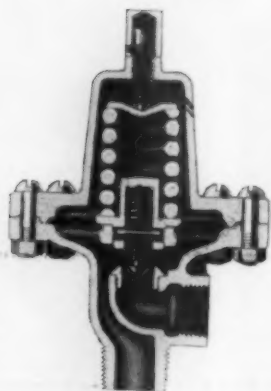
VALVES · FITTINGS · PIPE  
PLUMBING · HEATING · PUMPS

**MUELLER CO.**

Decatur, Illinois

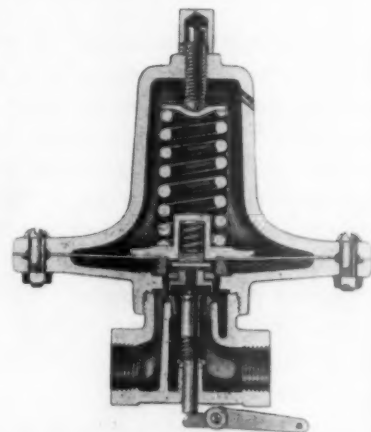
CHATTANOOGA, TENN. ★ LOS ANGELES, CALIF. ★ SARNIA, ONT., CANADA

FOUNDED 1857

**MUELLER REGULATORS AND RELIEF VALVES**

H-9045 Pressure relief valve without testing lever. Particularly adapted to hot or cold water, air or oil. Furnished for any pressure between 5 and 160 lbs. Made in  $\frac{1}{2}$ " size only, with  $\frac{3}{4}$ " outside thread inlet;  $\frac{1}{2}$ " inside thread outlet

All MUELLER Relief Valves have the EXCLUSIVE AUXILIARY SPRING SEATING PRINCIPLE which prevents imbedded seat discs and insures instant relief within 5% of the pressure setting. Used to protect domestic hot water tanks, heating systems, etc. MUELLER Regulators have larger diaphragms to insure sensitive regulation and maintain steady outlet pressure even though the inlet pressure fluctuates considerably. All are well made of high grade materials by skilled craftsmen.

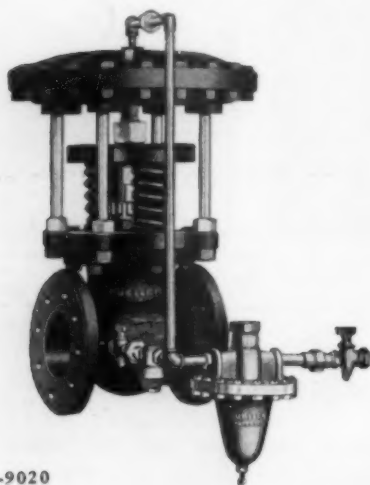


The H-9052 is a larger diaphragm operated relief valve with testing lever, covering a wide range of capacity. This valve conforms to the A.S.M.E. Code and meets the requirements for large boiler installations. Furnished set for any pressure between 5 and 160 lbs., in sizes  $\frac{1}{2}$ ",  $\frac{3}{4}$ ", 1", 1 $\frac{1}{4}$ ", 1 $\frac{1}{2}$ " and 2"



H-9080  
H-9090

The H-9080 steam regulator and the H-9090 air or oil regulator are the direct operated type, and are recommended for large reduction requiring limited volume. Variation in inlet pressure does not affect outlet pressure. Furnished in sizes  $\frac{1}{4}$ " to 2" inclusive



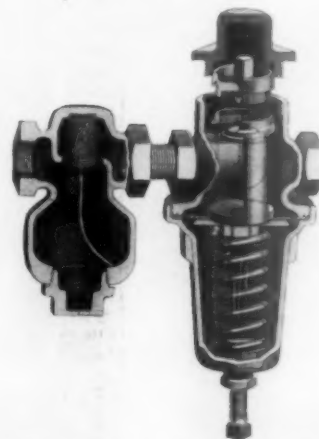
H-9020  
H-9070

The H-9020 auxiliary operated regulator for water or air service can supply full pipe line volume at accurately controlled delivery pressures. Has large seat opening and bronze working parts. The H-9070 is of similar construction but designed for steam service. Both are easily adjusted, and are well adapted to industrial service.

Sizes 1" to 12" inclusive



H-9030 The MUELLER Strainer is an inexpensive and reliable device which can be depended upon to stop foreign substances detrimental to every faucet and valve on the line. It soon pays for itself through a saving in repairs and maintenance. Regularly furnished with iron body; all bronze will be supplied upon order. Sizes  $\frac{1}{8}$ ",  $\frac{1}{4}$ ",  $\frac{3}{8}$ ",  $\frac{1}{2}$ ",  $\frac{3}{4}$ ", 1", 1 $\frac{1}{4}$ ", 1 $\frac{1}{2}$ ", 2", 2 $\frac{1}{2}$ ", 3" and 4"



H-9000 This Pressure Reducing and Regulating Valve and Strainer is recommended where the pressure exceeds 45 lbs. Especially adapted for residence, apartment building and industrial service. Regulator is all bronze with iron body strainer. Bronze strainer will be furnished upon special order. Furnished for initial pressures from 45 to 250 lbs., with delivery from 25 to 75 lbs. Sizes  $\frac{1}{4}$ ",  $\frac{3}{8}$ ",  $\frac{1}{2}$ ",  $\frac{3}{4}$ ", 1", 1 $\frac{1}{4}$ ", 1 $\frac{1}{2}$ ", 2" and 2 $\frac{1}{2}$ "



H-12060 Pedestal Laboratory Fitting. Pedestal inlet  $\frac{3}{8}$ " or  $\frac{1}{2}$ " inside I.P. thread. Outlets at right angle. Flat lever handles. Tapered corrugations for hose



H-12050 Pedestal Laboratory Stop. Pedestal inlet  $\frac{3}{8}$ " or  $\frac{1}{2}$ " inside I.P. Thread. Tapered corrugations for hose connections. Also furnished as one stop, three stop and four stop fittings

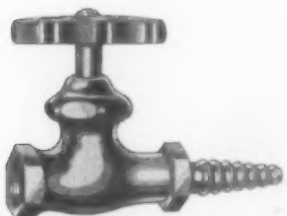


H-12015 Ground Key Laboratory Stop with tapered corrugation for hose. Flat lever handle. Inside I.P. Thread



H-12017 Ground Key Laboratory Stop with tapered corrugation for hose. Flat lever handle. Outside I.P. Thread

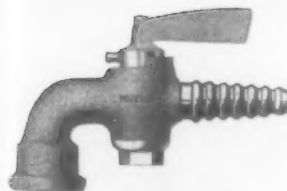
*Furnished with indexed handles upon request*



H-12020 Compression Laboratory Stop. Wheel handle and detachable hose nipple. Inside I.P. Thread

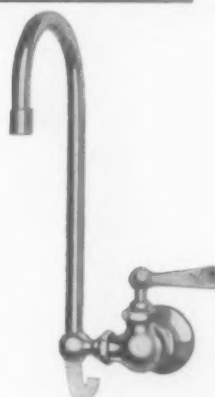


H-12040 Compression Laboratory Stop with detachable hose nipple and tee handle. Inside I.P. Threads

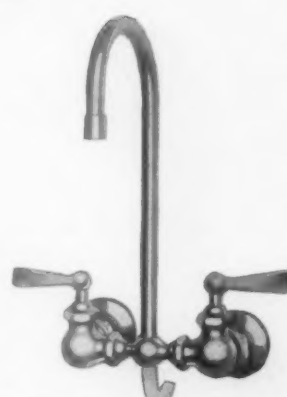


H-12010 Ground Key Laboratory Stop. Flat lever handle. Hose end has tapered corrugations. Inlet at right angle. Inside I.P. thread

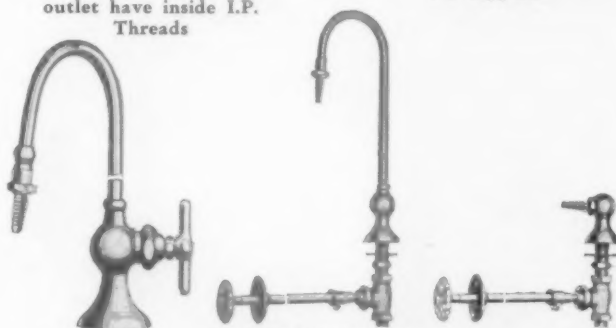
*Furnished with indexed handles upon request*



H-12080 Compression Swing Spout Faucet. Spout swings down into sink. Inlet and outlet have inside I.P. Threads



H-12085 Compression Double Swing Spout Faucet. Same as H-12080 except double supplies



#### PANTRY FAUCETS

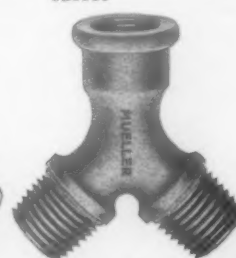
H-12090 Four Arm indexed (cold) Faucet regularly supplied

H-12092 Remote controlled with Wheel Handle

H-12093 Remote controlled with Wheel Handle and Turret Top. Can be furnished with one, two, three or four nipples in turret



H-12125 "Y" Connection.  $\frac{3}{8}$ " outside I.P. Thread inlet with  $\frac{1}{4}$ " inside I.P. Thread outlet



H-12130 "Y" Connection. Inside I.P. Thread inlet with outside I.P. Thread outlet



H-12145 Nipple with outside I.P. Thread inlet and tapered corrugation for hose outlet



H-12183 Turret with one outlet. Can also be furnished for two, three, or four outlets

Send for a copy of Mueller Laboratory Brass Goods catalog. Fully illustrated with complete data as to sizes and finishes available



# THE HALSEY W. TAYLOR CO.

Manufacturers of Drinking Fountains and Coolers

Warren, Ohio

AGENTS IN PRINCIPAL CITIES

## PRODUCTS

Halsey Taylor Drinking Fountains; Combination Cooler Drinking Fountains in Iced Water or Electric Types.

### DISTINCTIVE FEATURES THAT APPEAL TO ARCHITECT AND SCHOOL AUTHORITIES ALIKE

It was during the first World War that Halsey Taylor Drinking Fountains were introduced. Today, they are still accepted among the country's foremost fountains, because of their modern design, their distinctive patented features that spell convenience and sanitation alike, and their wide variety of models from which to choose. That is why they are still a preferred specification of architects and builders, whether for schools or other public buildings; industrial plants, hospitals or churches.



*You buy more than a mere fountain when you buy Halsey Taylor Drinking Fountains. You buy definite assurance of trouble-free service, positive health-safety, maximum convenience, built-in patented features exclusive with Halsey Taylor!*

It is in school operation that a fountain finds its greatest use as a factor in hygiene. When pupils drink from Halsey Taylor Fountains day after day, it is this assurance of health-safety that more than pays for the care in selecting the right make of fountain—and that make usually is Halsey Taylor, practically a standard in school installations the country over. Their most valued features are:

#### 1 — Practical Automatic Stream Control

An automatic device maintains constant height in drinking stream regardless of line pressure variation. Stream never too high, never too low.

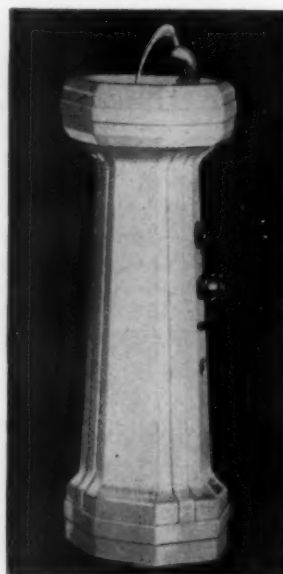
#### 2 — Ideal Drinking Mound

The two-stream projector with latest type guard makes the side stream both practical and health-safe, removing objections found with ordinary side-streams.

#### 3 — Definite Sanitation

Drinking mound is formed by the converging of two streams of water, setting up a localized drinking mound which makes it impractical to drink from any other point but the ideal height of the mound. Fingers or lips cannot come in contact with or contaminate water source. It is impossible to squirt the water.

THE AMERICAN SCHOOL AND UNIVERSITY—1944



Pedestal Type—No. 3916

One of many attractive pedestal and wall types



No. 3914



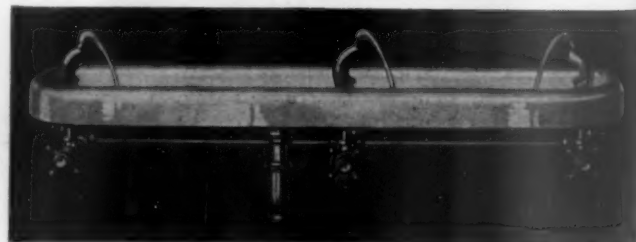
No. 3901

#### Battery Types

Many two- and three-part battery types especially adapted to school installations



No. 3912



No. 2703

### FOUNTAINS FOR EVERY REQUIREMENT

These pages show a few of the various types of Halsey Taylor Drinking Fountains. There are many models from which to select, all most modern in styling, all with the fundamental Taylor features. Send for catalog.

# The PHILIP HAAS CO.

Dayton 2, Ohio

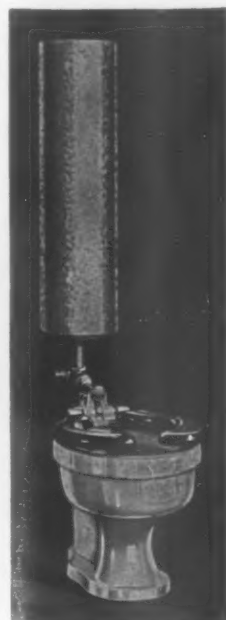
## *Haas Automatic Pressure Tank Closets*

Haas Automatic Pressure Tank Closets with MASTER Valve, Models 700 to 707, are specially designed for installation in schools and public institutions. Extremely durable, they combine the demand for water saving with that for automatic flush.

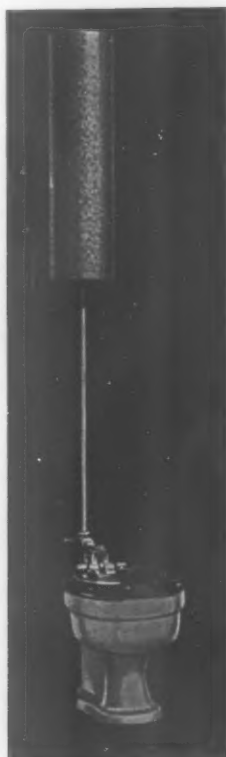
All combinations are equipped with the Haas MASTER Valve, an extremely simple, practical device which operates easily and surely, delivering a maximum of service at a minimum of upkeep cost. (When desired, old bowls can be equipped with these up-to-the-minute valves.)

BOOKLET AND PRICE LIST  
AVAILABLE ON  
REQUEST

### SYPHON JET COMBINATIONS



NO. 702



NO. 703



NO. 707



NO. 700



NO. 701



NO. 706

### WASHDOWN COMBINATIONS

Both Washdown and Syphon Jet Combinations include the Haas MASTER Seat Action Valve, sanitary open front and golden oak seat with reinforced hinge.

#### WASHDOWN COMBINATIONS

No. 700 has 8" x 24" galvanized pressure tank and extra heavy twice-fired vitreous china washdown bowl.

No. 701 is same as No. 700 but with 30" galvanized flush pipe.

No. 706 is same as No. 700 but with connections for concealing tank in the wall (as pictured).

#### SYPHON JET COMBINATIONS

No. 702 has 8" x 30" galvanized pressure tank and heavy twice-fired top spud, regular rim vitreous china syphon jet bowl.

No. 703 is same as No. 702 but with 30" galvanized flush pipe.

No. 707, same as No. 702 but with connections for concealing tank as shown.

# THE AMERICAN BRASS COMPANY

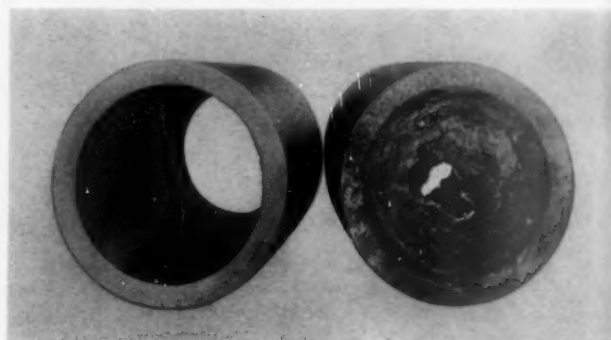
SUBSIDIARY OF ANACONDA COPPER MINING COMPANY

General Offices: Waterbury 88, Connecticut



## COPPER, BRASS and BRONZE for Building Construction

Maximum service life with minimum maintenance has led to the widespread use of copper, brass, and bronze in buildings of a permanent character. The American Brass Company supplies copper and a wide range of copper alloys in all commercial forms. The principal building uses are as follows:



This photograph shows brass pipe (left) and rustable pipe (right) after identical service

### ANACONDA BRASS PIPE AND COPPER TUBES

Anaconda Brass Pipe and Copper Tubes offer unrivaled durability. Their freedom from rust and high resistance to corrosion assure an uninterrupted flow of rust-free water for many years. Anaconda 85 Red Brass Pipe is recommended as the most

durable, corrosion-resistant pipe commercially available at moderate cost. Anaconda Copper Tubes, assembled with solder fittings, provide a non-rust piping system at an installed cost which, for smaller sizes, is comparable to the cost of steel or iron pipe.



### EVERDUR FOR WATER STORAGE TANKS

"Everdur," The American Brass Company's copper-silicon alloy, combines the durability, freedom from rust, and corrosion-resistance of pure copper with a tensile strength comparable to mild steel. Since Everdur is easily welded, many leading manufacturers of

water heating and storage equipment have adopted it as standard material for non-rust tanks. Everdur equipment is giving dependable service in many important institutional buildings, such as hospitals, schools and universities.

1,000 gallon water heater, made of Everdur Metal for Central School, Wappinger Falls, New York

THE AMERICAN SCHOOL AND UNIVERSITY—1944





The Kingswood School for Girls, near Detroit, Michigan, has a batten seam roof of Anaconda 16 ounce Sheet Copper. Gutters, leaders, cornices and louvers are also of this long-lasting metal

## ANACONDA SHEET COPPER

### Roofing

For centuries copper has been the roofing material of ultimate quality, has adorned monumental buildings and endured functionally for hundreds of years. Because of the attractive green patina which forms on copper in most locations, no other material will so enhance in beauty with age. Copper combines the qualities of stateliness and charm, warmth and dignity, with unparalleled service life.

The American Brass Company produces sheet copper in all standard sizes, weights and tempers for roofing, flashing, valleys, hanging and built-in gutters, leaderheads, leaders, etc.

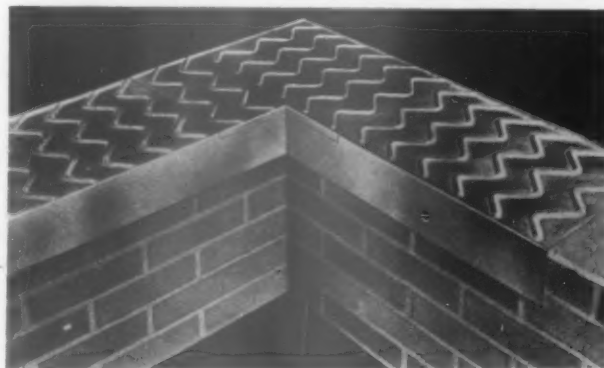
### Flashing



Copper is the ideal material for flashings of all types. It is durable, highly resistant to corrosion, and combines necessary strength with ductility. Copper flashings are easy to install and afford lasting protection against the penetration of water at roof joints, window frames, etc.

### Through-Wall Flashing

Anaconda Through-Wall Flashing is designed with a dam and corrugations which assure complete drainage of accumulated water in the desired direction. The corrugations are specially designed in a series of zigzag ridges to prevent lateral movement in any direction. Since this flashing will drain itself dry on a level bed, the risk of heaving by frost is minimized. Anaconda Through-Wall Flashing is furnished in standard types for 8" and 12" walls, and in special types for thicker walls.



### BRASS AND BRONZE FOR HARDWARE

Another important use resulting from the durability and attractive appearance of brass and bronze is for hardware of every description. Hardware of solid brass or bronze, which has no plating to wear through, is made by all leading hardware manufacturers.

### BRONZE FOR INSECT SCREENS

Anaconda Bronze Wire is a standard material for window and door screens. Bronze is strong and highly resistant to corrosion. The wire is furnished in golden bronze or antique finishes.

### RUSTPROOF CONSTRUCTION IS ECONOMICAL CONSTRUCTION

Copper, brass and bronze cost more than rustable metals. Installation costs, however, are practically the same. Many building owners know from experience that when service life and freedom from rust-caused repairs and replacements are taken into account, that copper, brass and bronze will cost less per year for any permanent building.

Consult Sweets Architectural File for additional information on Anaconda Building Products

# THE ELECTRIC STORAGE BATTERY COMPANY

World's Largest Manufacturers of Storage Batteries for Every Purpose

Allegheny Avenue and Nineteenth Street, Philadelphia, Pa.

Atlanta 3, Ga., 210 Walker St., S. W.  
Boston 34, Mass., 100 Ashford St.  
Chicago 9, Ill., 4613 S. Western Ave. Bldg.  
Cincinnati 2, Ohio, 718-19 Temple Bar Bldg.  
Cleveland 2, Ohio, 6400 Herman Ave., N. W.  
Dallas 1, Texas, 1511 Mercantile Bank Bldg.

Denver 2, Colo., 810 14th St.  
Detroit 4, Mich., 8051 W. Chicago Blvd.  
Kansas City 1, Mo., 129 Belmont Blvd.  
Los Angeles 15, Calif., 1043 S. Grand Ave.  
Minneapolis 2, Minn., 2340 Rand Tower  
New Orleans 12, 432 Balter Bldg.  
New York 18, N. Y., 23-31 West 43rd St.

Philadelphia 32, Pa., 17th St. & Indiana Ave.  
Pittsburgh 19, Pa., 596 Union Trust Bldg.  
St. Louis 3, Mo., 1218 Olive St.  
San Francisco 24, Calif., 6150 Third St.  
Seattle 4, Wash., 1919 Smith Tower Bldg.  
Washington 6, D. C., 1819 L St., N. W.

In Canada: EXIDE BATTERIES OF CANADA, LIMITED, 153 Dufferin St., Toronto



The Exide Chloride Battery in The Research Laboratory of Physics, Harvard University. It is used for general service

## FOR LABORATORIES, FIRE ALARM, PROGRAM CLOCKS, AUTO-CALL AND INTERIOR TELEPHONES

Exide Batteries are extensively used in the laboratories of the nation's foremost scientists, industrial research engineers, schools and colleges. Their performance records are the best testimony that can be offered as to their merit for laboratory services.

The foremost characteristics of Exide Batteries are absolute dependability and sustained high voltage until end of discharge. The operation of Exide Batteries is flexible. Cell connections to the battery can be arranged so as to give any desired voltage, with a wide range in discharge rates available at that voltage. By assigning a group of cells of the battery to a definite experiment, a constant voltage is assured which is free from disturbance or interference by any outside influence.

Exide Batteries of the sealed glass jar type have been carefully designed and are carefully constructed for laboratory service. They assure exceptional long life in laboratory service. Many Exide Chloride Batteries in laboratory and industrial installations have been in constant use for 20 or more years.

Regardless of how limited your budget appropriation, an Exide Battery can be selected to meet your requirements. Moreover, the wide experience of Exide engineers and the services of our nation-wide Exide organization are at your disposal. Write to the nearest Exide office shown above for further information.

# Exide

## BATTERIES

THE AMERICAN SCHOOL AND UNIVERSITY—1944

## EXIDE EMERGENCY LIGHTING

### Positive Protection Against Dangers of Sudden Lighting Failures

Either children or adults, you can never predict the actions of a crowd that is suddenly plunged into darkness. Danger is real. Danger of personal injury . . . danger to school property.

The utility companies take every precaution, but cannot control the effects of storms, floods, fires, and street accidents. Privately-owned plants, no matter how carefully planned and operated, may also have interruptions.

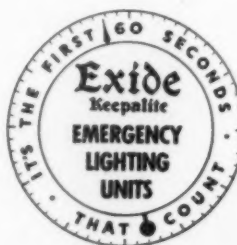
The only certain safeguard is an emergency lighting system that functions both instantly and automatically.

Electrical engineers agree that a storage battery, properly maintained, constitutes the most dependable source of emergency power.

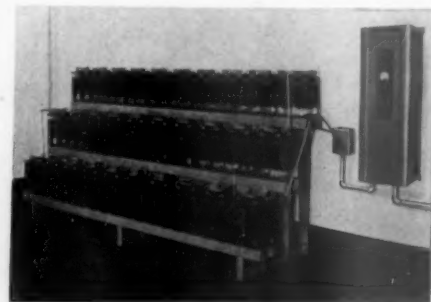
During an electric service interruption, Exide Keepalite furnishes the power from a dependable Exide Battery to the lights in auditoriums, gymnasiums, corridors exits, fire towers, stairways, engine rooms, locker rooms, swimming pools, dormitories, laboratories, etc.

Exide Batteries have been used in emergency service, by telephone, railroad and public utility companies since 1895. The new Exide Keepalite control equipment, which automatically keeps the battery properly maintained, represents the qualifications found desirable from the experience of more than 3000 installations in all kinds of buildings.

The exceptionally long life obtained from Exide Chloride Batteries used with the Exide Keepalite System assures many years of dependable emergency lighting service.



A typical Exide-Keepalite System with a 60-cell Exide Battery and a 3450-watt Control Unit. It operates instantly and automatically. The infrequent addition of water to the battery is the only maintenance required



# GRAYBAR ELECTRIC COMPANY, INC.

Executive Offices: Graybar Building, New York 17, N. Y.

## CONVENIENT LOCAL SERVICE FROM OFFICES IN OVER 80 PRINCIPAL CITIES

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Asheville, N. C.	Durham, N. C.	New Orleans, La.	St. Paul, Minn.
Atlanta, Ga.	Flint, Mich.	New York, N. Y.	Salt Lake City, Utah
Baltimore, Md.	Ft. Worth, Texas	Newark, N. J.	San Antonio, Texas
Beaumont, Texas	Grand Rapids, Mich.	Norfolk, Va.	San Diego, Calif.
Birmingham, Ala.	Hammond, Ind.	Oakland, Calif.	San Francisco, Calif.
Boston, Mass.	Harrisburg, Pa.	Oklahoma City, Okla.	Savannah, Ga.
Buffalo, N. Y.	Hartford, Conn.	Omaha, Nebr.	Seattle, Wash.
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Chicago, Ill.	Jacksonville, Fla.	Philadelphia, Pa.	Syracuse, N. Y.
Cincinnati, Ohio	Kansas City, Mo.	Phoenix, Ariz.	Tacoma, Wash.
Cleveland, Ohio	Knoxville, Tenn.	Pittsburgh, Pa.	Tampa, Fla.
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Columbus, Ohio	Los Angeles, Calif.	Portland, Ore.	Washington, D. C.
Corpus Christi, Texas	Louisville, Ky.	Providence, R. I.	Wichita, Kan.
Dallas, Texas	Memphis, Tenn.	Reading, Pa.	Winston-Salem, N. C.
Davenport, Iowa	Miami, Fla.	Richmond, Va.	Worcester, Mass.
Dayton, Ohio	Milwaukee, Wis.	Roanoke, Va.	Youngstown, Ohio



## AN ALL-INCLUSIVE ELECTRICAL SUPPLY SERVICE FOR SCHOOLS AND UNIVERSITIES

Through its nationwide network of warehouses and offices, GRAYBAR distributes the products of more than 200 of the nation's leading manufacturers of electrical equipment and supplies. Its services are based on 75 years of experience in the electrical field.

Experienced GRAYBAR representatives and field specialists can perform unusually useful functions for the school architect, the electrical contractor, and the buyer of electrical maintenance supplies—going far beyond mere “order-taking.”



### AID FOR POST-WAR PLANNING

GRAYBAR is fully informed on modern equipment for school lighting, communication, signaling and alarm systems. Specialists familiar with school installations in other communities will advise on choice of equipment and planning of the system.



### SERVICE ON ESSENTIAL SUPPLIES

GRAYBAR representatives can help your staff meet wartime difficulties in processing the electrical products necessary to keep going. From their broad knowledge of electrical supply sources and equipment they can almost always suggest alternates for unavailable items. 3513

## PRODUCTS LIKE THESE COME FIRST VIA GRAYBAR



ALARM SYSTEMS • ANNUNCIATORS • APPLIANCES • AUDIOMETERS • BATTERIES • BELLS • BUZZERS • CABLE • CALL SYSTEMS • CIRCUIT  
BREAKERS • CLOCKS • COMMUNICATION • CONDUIT • CONTROLLERS • CORDS • DRY CELLS • FANS • FITTINGS • FIXTURES • FLOODLIGHTS  
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THE AMERICAN SCHOOL AND UNIVERSITY—1944





# The EDWIN F. GUTH CO.

*"Leaders In Lighting Since 1902"*  
**FLUORESCENT and INCANDESCENT LIGHTING**

2615 Washington Ave.  
 St. Louis 3, Mo.

Phone: JEFFERSON 3200



## INDIRECT LIGHTING

Guth Indirect Lighting provides complete concealment of the light-source. The illumination at desk level is uniform, shadowless and glareless. All glare, or any semblance of glare is completely eliminated. The spectral quality of Guth ALZAK Aluminum indirect lighting is exhilarating. Guth Indirect Luminaires are available in various designs with efficient ALZAK Aluminum reflectors which are guaranteed permanent. Write for Guth Booklet No. 662.



## SPECIAL LIGHTING EQUIPMENT

For the school entrance, vestibule and entrance exterior write for Guth special designs. Our designing and engineering departments are readily available to supply these designs and quote you prices.



## RECESSED LIGHTING

For the auditorium, hall or classroom; for Incandescent or Fluorescent lamps; write for full details.



## GYMNASIUM REFLECTORS—GLASS GLOBE LIGHTING

For High-Bays in Gymnasiums. For efficient lighting in manual training and vocational areas. Also glass-globe lighting in class-rooms; utility type fixtures; write for Guth Catalog No. 42.

For every school-lighting problem, a Guth Luminaire has been designed to solve it. Our engineers are available for helpful services and solution of current problems, or postwar problems.

Fluorescent and Incandescent light sources and the new ULTRA-VIOLET lamp for control of contagion in schools, have been pioneered and engineered by Guth, and to-day we offer the most complete line of luminaires and fixtures for proper utilization and utmost comfort for all school lighting and air-disinfecting problems.

## INQUIRIES

Information regarding our products and production facilities will be furnished on request. Complete engineering layouts and unbiased considerations will be given. Your inquiries are invited.



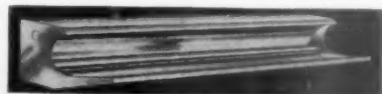
## GUTH-FANS

Guth-Fan—"Cools You All Over"—the healthful way! Its complete-cycle, air-circulation keeps the room-air always fresh, moving and stimulating. No direct blasts, or drafts. Write for Catalog No. 8.



## FLUORESCENT LIGHTING

Guth Fluorescent Luminaires are available for all types of school illumination, including glass-diffusing, lamp-shielding (Egg-crate types), exposed-lamp types and totally indirect Fluorescent. Guth Fluorescent can be mounted directly to the ceiling, or suspended on hangers. Write for catalog information and complete engineering details.



## ULTRA-VIOLET FIXTURES

### For Air-Disinfection

Guth ULTRA-VIOLET fixtures are for use with the new Germicidal lamps which kill air-carried bacteria. ULTRA-VIOLET reaches germs by the simplest, most efficient method possible. Helps control epidemics of colds, Flu and childhood maladies. Write for Guth Folder 758 for complete layout details.



## EXIT AND DIRECTIONAL SIGNS

All types of exit, rest-room and gymnasium signs; also special designed signs available.



**"LEADERS IN LIGHTING  
 SINCE 1902"**

St. Louis 3, Mo.

# THE F. W. WAKEFIELD BRASS COMPANY

1944 Yearwood Park, Vermilion, Ohio

Over Thirty Years a Manufacturer of Lighting Equipment

DISTRIBUTORS IN 108 CITIES

Plan now for postwar  
classroom lighting by

## WAKEFIELD

... filament or fluorescent

...

### The COMMODORE

for filament lamps

Glareless, indirect light

Molded from Plaskon

Low maintenance cost



SCIENTIFICALLY designed to give the right light for easy seeing and eyesight protection, the Wakefield COMMODORE makes any schoolroom, old or new, more cheerful and more effective. With its simple, lightweight shade, molded from Plaskon, the COMMODORE also brings users these important advantages: 1. Unusually efficient indirect light; 2. Easy cleaning; 3. High degree of safety; 4. Far less breakage; 5. Low maintenance cost; 6. Smart, modern appearance. Why not make the COMMODORE part of your postwar plans?



Guarding eyesight has new importance now, with wartime adult-training classes meeting in schools. COMMODORES provide 30 footcandles of diffused light for such a class at the Case School of Applied Science

### HOW THE COMMODORE HELPS GUARD SIGHT

According to Electrical Testing Laboratories, famous New York research and testing organization, the COMMODORE gives 86% of the light from the bare bulb. That means more light than most indirect fixtures... and it is soft, generous, diffused light... to make seeing easier, put far less strain on young eyes. For best results, light colored ceilings are necessary.

THE AMERICAN SCHOOL AND UNIVERSITY—1944

### MODERNIZES SCHOOLROOMS OVERNIGHT

Night classes resulting from the government wartime educational program emphasize the necessity for better lighting in many a school. The COMMODORE provides a practical answer since it can modernize seeing conditions at once... quickly makes your worst-lighted room your best lighted. It provides new eyesight protection for daytime pupils too.

Incidentally, better light from the COMMODORE'S simple, modern design not only makes a world of difference in the appearance of the room but in the attitude of the people in it! They are more attentive; study more effectively; and feel fresher, in rooms lighted with COMMODORES.



SEE THE DIFFERENCE... before and after  
Here in one unretouched photograph you see a striking comparison of lighting results. Taken from outdoors it shows at a glance how the COMMODORE improves seeing conditions. Upper room in this Ashland, Ohio, school lighted with old units; lower room with COMMODORES

### WRITE FOR INTERESTING BOOKLET

Filled with case histories from schools all over the country, this booklet offers tested suggestions on how to have better light... outlines factors to watch in addition to lighting... pictures the results obtained. It provides facts genuinely helpful to school superintendents and school business officials. Write for your copy. **Note:** The COMMODORE is still available for essential use, if your budget permits action now.

If you're thinking about **FLUORESCENT**... let us help you. Many a school, prevented from having fluorescent lighting by the war, is thinking of it for post-war applications... because of its highly successful use in war production. Wakefield pioneered in fluorescent lighting for school use, has continued to make equipment for essential war needs. While we cannot show you how post-war fixtures will look, we can assure you that Wakefield fluorescent equipment will include all the latest developments of lighting research and engineering. And we will be glad to give you or your architects the benefit of our full experience, in planning for tomorrow.

# HOLOPHANE COMPANY, INC.

342 Madison Avenue  
New York City

## PLANNED LIGHTING *for Every School Need...*



In-Built Classroom Lighting



Classroom Lighting with Pendent Units



Special Lighting Service Arcade



Ideal Gymnasium Lighting

THOUSANDS of public and private schools and colleges throughout the United States are Holophane lighted. The systems employed represent 50 years of leadership in the lighting industry based on proven methods and continued research which assures the best in lighting technique.

For every area in the school there is a Holophane lighting unit *specifically* designed to provide the most adaptable illumination for the purpose. Holophane Planned Lighting is effective, efficient, economical. Each *specific* can be depended on to produce the greatest amount of useful light. There is no permanent depreciation of the prismatic glass light controlling surface and temporary depreciation is a minimum.

School executives, board members, architects and engineers are invited to avail themselves of Holophane's free Engineering Service to determine the best type of lighting for their school needs.

— SEND US YOUR PLANS TODAY! —

THE AMERICAN SCHOOL AND UNIVERSITY—1944





Blackboard Lighting with Controlenses

Music Room  
Lighted with  
ControlensesGymnasium  
Lighted with  
Hibay Reflectors

**M**OST communities are now formulating their postwar school building plans. The selection of suitable lighting is an important factor. Today, with so many variable factors affecting so important a decision, it is vital that expert assistance be obtained.

Holophane engineers will gladly study your proposals and submit complete recommendations as to type of equipment, light source, and proper lighting levels to assure continued efficient, effective, economical lighting.

**LET US HAVE A PART IN YOUR  
POSTWAR PLANS**



**THE AMERICAN SCHOOL AND UNIVERSITY—1944**

Manual Training Classroom Lighted with Holophane Lobay  
Industrial Reflectors

Auditorium Lighted with Holophane In-Built Controlenses

# INTERNATIONAL BUSINESS MACHINES CORPORATION

## INTERNATIONAL TIME RECORDING DIVISION

Time Recorders, Electric Time, Program Signaling, Fire Alarm, Telephone, and Industrial Paging Systems

WORLD HEADQUARTERS BUILDING

590 Madison Avenue, New York, N. Y.

### BRANCH OFFICES AND SERVICE STATIONS IN THE FOLLOWING CITIES

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Cleveland, Ohio  
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Duluth, Minn.  
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Grand Rapids, Mich.  
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Harrisburg, Pa.  
Hartford, Conn.  
Houston, Tex.  
Huntington, W. Va.  
Indianapolis, Ind.  
Jackson, Miss.  
Jacksonville, Fla.  
Jefferson City, Mo.  
Johnson City, Tenn.  
Johnstown, Pa.  
Kalamazoo, Mich.  
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Knoxville, Tenn.  
Lansing, Mich.  
Lima, Ohio  
Lincoln, Neb.  
Little Rock, Ark.  
Lorraine, Ohio  
Los Angeles, Calif.  
Louisville, Ky.  
Madison, Wis.  
Mansfield, Ohio  
Memphis, Tenn.  
Miami, Fla.  
Milwaukee, Wis.  
Minneapolis, Minn.  
Mobile, Ala.  
Moline, Ill.  
Montgomery, Ala.  
Muskegon, Mich.  
Nashville, Tenn.  
Neenah, Wis.  
Newark, N. J.  
New Haven, Conn.  
New Orleans, La.  
New York, N. Y.  
Norfolk, Va.  
Oakland, Calif.

Oklahoma City, Okla.  
Olympia, Wash.  
Omaha, Neb.  
Peoria, Ill.  
Philadelphia, Pa.  
Phoenix, Ariz.  
Pittsburgh, Pa.  
Port Arthur, Tex.  
Portland, Me.  
Portland, Ore.  
Providence, R. I.  
Racine, Wis.  
Raleigh, N. C.  
Reading, Pa.  
Richmond, Va.  
Roanoke, Va.  
Rochester, N. Y.  
Rockford, Ill.  
Sacramento, Calif.  
Saginaw, Mich.  
St. Louis, Mo.  
Salt Lake City, Utah  
San Antonio, Tex.  
San Diego, Calif.  
San Francisco, Calif.  
San Jose, Calif.

Savannah, Ga.  
Scranton, Pa.  
Seattle, Wash.  
Shreveport, La.  
South Bend, Ind.  
Spokane, Wash.  
Springfield, Ill.  
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Tulsa, Okla.  
Utica, N. Y.  
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Waterbury, Conn.  
Westerly, R. I.  
Wheeling, W. Va.  
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Wilmington, Del.  
Winston-Salem, N. C.  
Worcester, Mass.  
York, Pa.  
Youngstown, Ohio

### PRODUCTS

Self-regulating Electric Time Systems, Program Signaling Devices and Systems, Tower and Outside Clocks, Attendance Time Recorders,



Job Time Recorders, Time Stamps, Recording Doorlocks, Watchclock Systems, Athletic Event Timers, Fire Alarm, Interior Telephone, and Central Control Sound Distribution Systems.

### TIME RECORDERS, ELECTRIC TIME, AND PROGRAM SIGNALING SYSTEMS

International provides a wide variety of timing equipment suitable for the time-indicating, -signaling, and -recording needs of every type of institution, business and industrial organization. Most of the various devices operate either independently or as auxiliary units in the Self-regulating Electric Time System—a system which automatically maintains uniformly accurate time service throughout a building or group of buildings. The International Master Time Control supplies correct time for an unlimited number of auxiliary timing devices and supervises their performance. Once each hour every unit in the system is compelled to compare itself with system time and to make any necessary corrections.



Printtime Stamp



All-electric Direct Read Attendance Time Recorder



Job Time Recorder



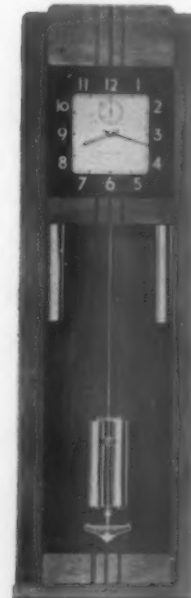
Metal Disc Program Signal Control



Secondary or Wall Clock



A Typical Tower Clock Built Specially to Conform with Architectural Plan



Mercurial Pendulum Master Time Control

All Products Shown Are Available only Under Priority Allocations

### FIRE ALARM SYSTEMS

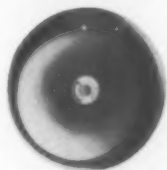
International Fire Alarm Systems are specifically designed to provide the most dependable type of life and property protection. They are furnished in many different types to meet the varied local and State fire regulations, but all conform to a single standard that insures positive operation.

Outstanding characteristics of International Systems are: simplicity in initiating alarms; certainty that the act of pulling a lever or breaking the glass of an alarm station will set the signals into operation; and certainty that the alarms will be heard distinctly throughout the protected area.

Data sheets available in all International Offices.



Break Glass Station



Fire Alarm Gong



Typical Fire Alarm Control Panel

All International equipment, including Fire Alarm Systems, carries the approval label of the National Board of Fire Underwriters.

### INDUSTRIAL PAGING SYSTEMS

These systems provide a rapid, convenient, and sure way to locate individuals within a plant or commercial organization, or to reach all members of the personnel simultaneously, with important information or emergency instructions.

The equipment consists of a centrally located transmitter and a sufficient number of sound reproducers to insure complete coverage of a working area. The transmitter is usually placed at or near the private telephone switchboard and controlled by the telephone operator. The sound reproducers are of several types, scientifically designed to operate with maximum efficiency according to the location. In addition to several types for indoor use, there are weatherproof reproducers for outdoor installation.

Operation of the International Paging System is exceedingly simple—any announcement or request for the location of an individual in the plant is made by the telephone operator who presses a key and repeats the request into the transmitter. The message will be heard throughout the entire plant or only in a selected area, depending on the key or keys pressed.

This system serves also for the rapid dispatch of emergency instructions to maintenance men, distribution of chime or other mechanical sound dismissal signals, and "broadcasting" of either phonograph or radio programs.

IBM Sound Equipment manufactured also for schools, colleges, and other institutions.

### ENGINEERING AND SPECIFICATIONS-WRITING SERVICE

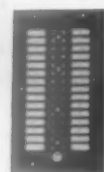
IBM branch offices are staffed and equipped to render expert engineering and specification-writing service for the various types of low tension equipment listed above. This service is immediately available. Data Sheets on request.

THE AMERICAN SCHOOL AND UNIVERSITY—1944

### INTERIOR TELEPHONE SYSTEMS



Cradle Type Telephone



Telephone Keyboard



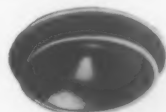
Surface Wall Telephone

International Telephone Equipment applies strictly and exclusively to intra-communication as a means of purely local administration, management or convenience, and in no way conflicts with public telephone service. It is an automatic administrative aid that permits rapid and efficient transmission of information between individuals and departments.

International Telephone Instruments are of high quality, designed in a variety of convenient styles. Almost any kind or size system is available from a simple two-station line to a standard size switchboard exchange serving hundreds of phones.

### ELECTRICAL LABORATORY EXPERIMENTAL PANELS

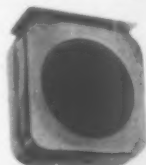
International Laboratory Panels are built to meet the requirements of the scientific laboratories of modern schools and colleges.



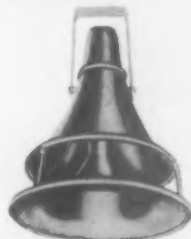
Medium Power Sound Circulator



Medium Power Directional Voice Projector



Two-way Metal Sound Reproducer



High Power Sound Circulator



Central Transmitting Station for PBX Switchboard  
Transmitter mounted on adjustable swivel



Typical Amplifying Unit  
Consists of pure Class "A" high-gain amplifier with output of 2400 units of coverage.



# BELL SOUND SYSTEMS Inc.

1183 Essex Avenue, Columbus 3, Ohio

Intercommunication, Paging, Amplifying, Recording and  
Public Address Systems. Also Special Systems and Electronic Devices



Bell Sound Systems has established a recognized leadership in bringing modern styling and introducing improved circuits and designs to the sound equipment field. A reputation attested to by the leading institutions now using Bell equipment.

With an extensive line and the engineering facilities to build the right equipment for the particular job Bell can supply any of your demands. So consult with Bell. Also write for general catalog which will give a more complete story for your reference files.

## COMPLETE SYSTEM FOR SCHOOLS

### Zephyr Model 601



- MODEL 601 — ZEPHYR — (Unit shown above)**
- |   |  |
|---|--|
| 1—Model 615 Amplifier Unit,<br>15-watt (less tubes) | 1—Electric Phone Turntable<br>and Pickup |
| 1—3½ watt Call-Reply Amplifier<br>(less tubes)      | 1—Headphone Monitor Input                |
| 1—6 Tube Superheterodyne Radio<br>(less tubes)      | 1—Set of 10 Room<br>Switches             |
|   | 1—Walnut Cabinet                         |

Everything needed to give the modern school, hotel, club or hospital an all-purpose sound system is available in the new Bell Zephyr Unit.

**RADIO**—A high-quality, superheterodyne receiver of standard manufacture, features: Frequency coverage, 537 to 1660 KC, 5.85 to 18.8 MC—6 tubes, including cathode-ray tuning indicator (magic eye)—R.F. mixer, and oscillator stages on all bands—3-Gang precision-tuning condenser—Full-vision, calibrated dial—7¼" Linear scale; vernier tuning—Sensitivity control—Single-stage, high-gain ferrocarril I.F. channel—Automatic volume control—Audio-volume control.

**AMPLIFIER**—A 15-watt amplifier, with a total harmonic distortion of not more than 5% under average output conditions. Circuit is four-stage class-A resistance coupled. Filter components are built into the amplifier chassis. The room-selector keys are of the lever-operated three-position type, each switch having positions for talk-back, radio or phono, and off. For larger requirements an amplifier having additional power output can be furnished.

**PHONO PICKUP**—The electrical turntable and phonograph pickup are capable of playing 10" or 12" laterally-cut records. One-speed motor provides for 78 r.p.m. records. Special phono units can be supplied if desired.



Unit illustrated is typical of the various size BELfone Master Units that are available

## BELfone Intercommunicating Systems

for Two-Way Conversation — Any Number Stations

With BELfone you just touch a switch and talk with any individual in any department of your office or school! Or you can confer with several at once. You save time and steps . . . and get instant action on your orders. With standard BELfone units, of either desk or wall-mounted type, a system of any number of desired stations can be installed at a very economical cost. Outline your requirements and let us offer recommendations.

## VOICE PAGING SYSTEMS

for Broadcasting Music, Announcements, etc.



## PORTABLE PUBLIC ADDRESS SYSTEMS

Bell, as one of the pioneer manufacturers of Portable Public Address Systems, offers you a wide selection of the highest quality sets available in capacities ranging from 5 watt to 50 watt. (Same systems for permanent installations are available up to 100 watt where large numbers of wall speakers are required.) System is composed of amplifier, speakers and microphone, all self contained in durable, compact carrying case or cases.



The Bell Voice Paging System offers for the first time a truly heavy-duty system readily adaptable to any requirement, for broadcasting music, announcements, signals or paging.

An "on-off" switch, a microphone with either a hand or foot "Talk-switch," and a phonograph unit (if recordings are to be used) are all located at control station. A Driver or Control Amplifier and one or more Speaker Amplifiers (AC operated) are remotely located at convenient points. Loud speakers are then strategically located in all departments or buildings to be covered by the system. Though the on-off switch is turned on, the units, being relay operated, merely idle except during actual broadcasting. Control circuits are of low voltage-type. Each speaker power amplifier is of 100-watt capacity and under average conditions will adequately handle up to 15 speakers.

# RADIO CORPORATION OF AMERICA

EDUCATIONAL DEPARTMENT, RCA VICTOR DIVISION

Camden, New Jersey

## PLANNING TOMORROW'S SCHOOLS



AFTER VICTORY is won we will be living in a new world...a world vastly changed by years of war...a world so shrunken by radio and the airplane that we Americans will be neighbors with the most distant parts of the earth...a world in which the responsibilities of our educational system will be far greater than ever before. Indeed, America's schools, along with America's adult population, must be ready to meet the increased responsibilities of citizenship in this new world if a permanent peace is to be maintained.

It's a big assignment, but America's schools will handle it. Progress-minded school administrators, school-board members, teachers and architects are planning *now* for this critically important post-war era in education. Their planning involves improvements in curriculum and teaching methods...in school buildings and equipment...and in the construction of new schools, built to accommodate modern equipment.

This section is designed to help all those who are interested in "planning tomorrow's schools." School administrators and others desiring more specific details concerning school building construction or renovation should consult their architects and electrical contractors. Additional information may also be secured by writing to the Educational Department, RCA Victor Division, RADIO CORPORATION OF AMERICA, Camden, New Jersey.

## RCA SCHOOL SOUND SYSTEMS

NO GOOD SCHOOL of the future, public or private, can afford to be without a modern sound system. Successful experience in thousands of schools has already proved the value of such systems—many of which have now been in operation over a period of several years.

The School Sound System provides a simple means for quick, easy distribution of radio programs, phonograph recordings and on-the-scene vocals to any or all rooms of a school building or buildings.

The Sound System *also* serves as a communication center from which the School Administrator, his assistants or members of the faculty can effect instant contact with any or every part of the school. Obviously, such a system is especially valuable for broadcasting instructions in case of an emergency.

Certain provisions should be made during school building construction for wiring, space, and electric power outlets in order to provide for the installation of equipment at a later date. It is far more economical to provide for these basic essentials during the construction period than it is to make such provisions after the building has been completed.

A well-ventilated room (12' x 15') should be provided to house the central control equipment. In smaller schools, limited space close to the Principal's office will provide the necessary room.



THE AMERICAN SCHOOL AND UNIVERSITY—1944

Adjacent to the control room should be a studio properly constructed of sound-proof materials to provide students interested in history, English, music, and other such studies, with an opportunity of presenting their programs to students in selected classrooms, or for broadcasting over the local radio station.

Instantaneous disc recordings may be made of student programs originating within the studio as well as of incoming radio programs which can be presented at a convenient hour for those teachers and students interested.

The building may be completely wired for sound at the time of construction, or provisions may be limited to conduit risers between floors with surface conduit, molding, or exposed wiring to individual rooms left for later installations.

Standard wiring practice for sound system installation calls for a large conduit, holding a number of pairs of wires, to be run to a central point and terminated in a junction box. From

this box, smaller conduits with successively smaller numbers of wires branch out until finally a single pair of wires terminates at each loudspeaker. If the entire conduit system is installed during building construction or renovation, it can be installed within the walls and partitions.

Electric power-outlets to supply operating current for the Sound System are required in the control center and in the studio. A single heavy-duty power-outlet, supplied by a separate circuit, is the minimum requirement for both control center and studio. In addition, several convenience outlets will be found useful for auxiliary equipment.

It is highly desirable to install microphone outlets in several locations throughout the building in order that programs may originate from a specific classroom. These rooms would include the Choral Room, Band and Orchestra Room, Music Appreciation Room, Public Speaking Room, Auditorium, and Principal's Office.



## THE LIBRARY IN TOMORROW'S SCHOOLS

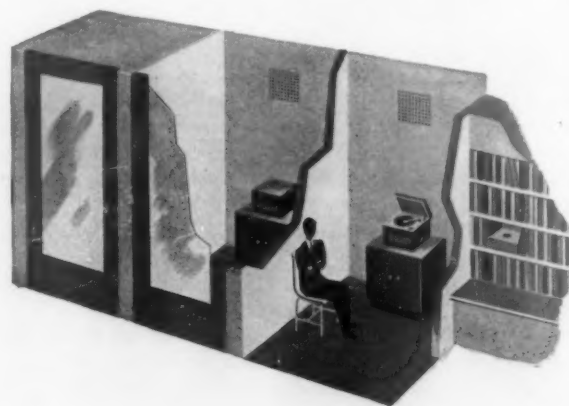
**T**HE FUNCTION of the school library and the services of the librarian will both be considerably expanded in the post-war period because of the additional teaching tools which will then be available.

Classroom films and slides, as well as phonograph records and related materials, can be more easily stored and supervised by an experienced librarian than by individual classroom teachers, whose time is occupied with instruction. Students in literature, history, music, and other subjects should be given an opportunity to refer to appropriate phonograph records, just as they now refer to books and other printed material.

Comparatively inexpensive turn-tables may be installed on the tops of study tables where students may listen with headphones without disturbing others who are using the library for reading or study purposes.

Some school administrators may desire to furnish separate booths where students may listen to records and radio programs. Should the listening booth contain glass doors and be placed where the librarian may easily supervise their activities, students

in groups may be in a position to receive the greatest amount of stimulation from radio and recorded programs.

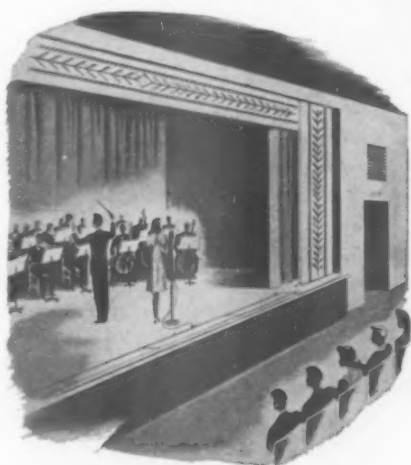




## RCA SOUND EQUIPMENT IN THE AUDITORIUM

**T**HE SCHOOL AUDITORIUM needs special attention in the installation of various types of electrical equipment because of the large number of student and community activities which are centered there.

The stage should have several microphone outlets for reinforced speech and music. They should be spaced approximately fifteen feet apart, and should be located along the front and rear of the stage. An additional microphone outlet should be placed



near the rear of the auditorium to assist the director during rehearsals of plays, pageants, operas, and other dramatic offerings.

Power outlets should be provided near the front of the stage to facilitate the attachment of record reproducing equipment. It is also desirable to have an outlet near the center of the auditorium for the use of Slide Film Equipment, and 16 mm. Sound Projectors.

For best results it is considered essential to build a Projection Booth in the rear of the auditorium large enough to house two 35 mm. Sound Projectors. Within the booth, it will be necessary to install several outlets, together with two special power outlets which are capable of carrying 100 to 150 amperes. Thirty-five millimeter projectors, using arc lamps, demand special consideration. It is very costly to replace inadequate lines, and accordingly, provision for the proper amperage should be made during construction.

It is impossible to follow a definite rule in regard to the placement of power outlets in auditoriums and classrooms. It has been the custom in many public buildings to install the outlets in the wall close to the floor. This makes the outlets vulnerable to dust and dirt, as well as corrosion caused by water. Wherever possible, it is suggested that the outlets be placed twenty to thirty inches above the floor level.

A booklet, *Projection Room Plans*, is available from the Society of Motion Picture Engineers, Hotel Pennsylvania, New York City, for fifty cents. This publication gives a detailed discussion of the necessary requirements for the construction of the Projection Booth.

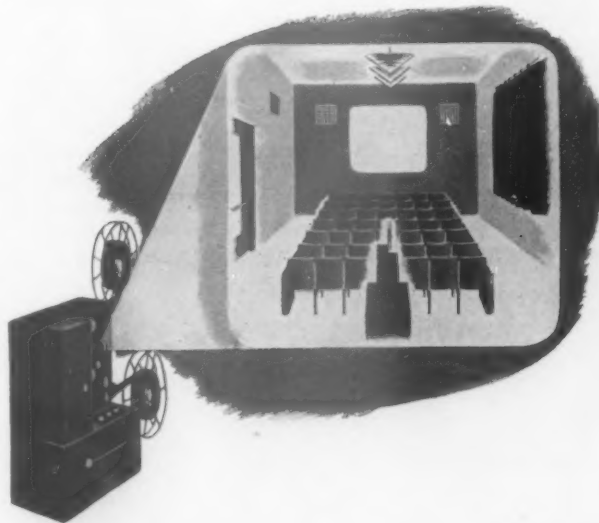
## DESIRABLE PROJECTION FACILITIES

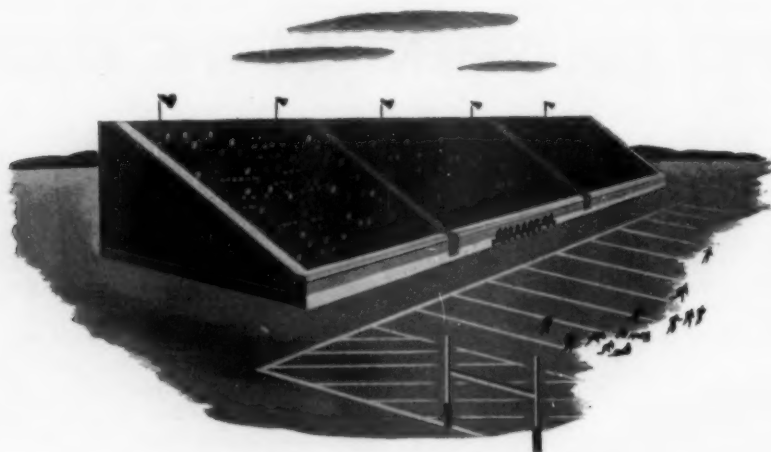
**B**ASIC REQUIREMENTS for the projection of 16 mm. sound motion pictures, silent motion pictures, slide films, miniature slides, and opaque material are: 1. Appropriate electric outlets. 2. Adequate darkening facilities. 3. Suitable screen and screen position. 4. Reasonably good acoustics. 5. Proper projection equipment.

There should be one double outlet at the back of the room at a convenient height for accessibility. Another single or double outlet at the front of the room will aid in those situations where opaque projection is desired.

The question of darkening the room is an important one because incandescent lights cannot compete with daylight. Black shades are used most commonly, but other opaque cloth will be found satisfactory even though it is light in color. Wood or metallic shutters serve very well and also permit ventilation which is sometimes hampered by opaque shades.

There are many instances in which it is important to have a screen surface with a wide angle of reflection. The diffusive properties should be taken into consideration when selecting screens so that pupils seated at wide angles will not receive distorted, poorly lighted images. The width of the screen should be approximately one-sixth the depth of the classroom or auditorium.





## THE MODERN STADIUM

**T**HE STADIUM should contain a sound system, and a sufficient number of speakers so that one may hear clearly any program which is presented on the field, over the radio, or from other sources. During a football game or other type of activity, an announcer can describe the action taking place on the field. The coach will find it advantageous to sit up in the stadium occasionally during practice scrimmage, and comment to the

teams through the loudspeakers.

The size of the stadium will influence the number and location of the speakers. It is essential to have an excess capacity of amplification available in a stadium, in order to overcome the high noise level which is present among large crowds. Especially is this desirable during an emergency.

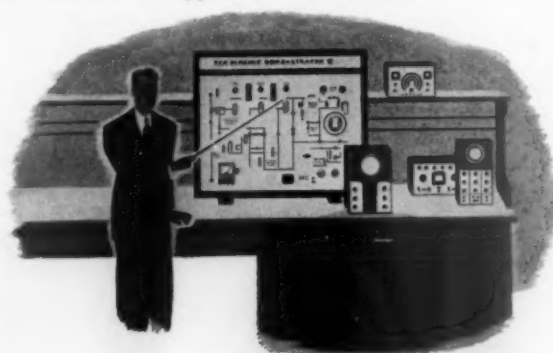
## RCA TEST AND LABORATORY EQUIPMENT

**I**N THE post-war period, electronics will play an important part in every-day life — in the home, the school, business, and industry. In order to train our post-war students to cope with basic electronics apparatus, it is probable that science departments will provide courses in the fundamentals of electronics. Anticipating this trend, RCA is already developing radio circuits, testing equipment and special electronics apparatus to be used for instructional purposes. It is therefore important to consider the adequate provisions for electrical outlets on the worktables in science laboratories as well as radio antennae and microphone outlets.

Students will doubtless wish to experiment with television equipment and other such apparatus in their electronics laboratory and, accordingly, proper facilities should be made available.

In view of the special requirements for FM and television receiving antennae and lead-ins, it is preferable merely to install

adequate conduits and omit the lead-in wiring until final decision is reached as to the apparatus to be installed.



# THE CINCINNATI TIME RECORDER CO.

Cincinnati, Ohio

---

## CINCINNATI LANDIS



## TIME is our BUSINESS!

**S**CHOOL MANAGEMENT is Big Business. For almost half-a-century CINCINNATI-LANDIS Clocks, Signaling Systems and CTR Time Recorders have provided dependable, accurate service to schools and colleges. Complete information on master and secondary clocks—program machines—push button boards—program bells, buzzers, horns—employees' time recorders—time stamps—synchronous program systems, etc., gladly sent on request.

Consult CTR representatives without obligation regarding your timekeeping, time signaling and time recording problems.

THE AMERICAN SCHOOL AND UNIVERSITY—1944



# THE STANDARD ELECTRIC TIME COMPANY

97 Logan Street, Springfield, Mass.

BRANCH OFFICES IN PRINCIPAL CITIES

Manufacturers of

**"Standard" Electric Time, Telephone, Fire Alarm Equipment and Laboratory Test Panels**



Master and Program Clock, and Secondary Clock

## ELECTRIC CLOCK SYSTEM WITH AUTOMATIC PROGRAM CONTROL

Operates indirectly from the lighting current but not dependent upon it for accuracy.

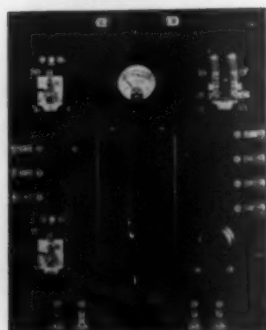
Master clock operates one to several hours with current interrupted.

All secondary clocks, program clocks, etc., individually reset hourly to correct time after any current interruption or other irregularity up to 25 minutes (fast or slow).

Long wearing with extremely low maintenance cost. (Many systems have been in continuous operation over 40 years.) Room clocks require no cleaning, oiling or regulating. Movements of simple magnetic, gravity type with an effective life three or four times that of synchronous type movements.

Provides a continuously reliable, accurate time service throughout the building.

Secondary clocks are available in a wide variety of designs to harmonize with architecture or type of room such as a gymnasium, swimming pool, etc.



Gong

Above: Master Code Panel with Supervisor and Break Glass Station

## FIRE ALARM SYSTEMS

Furnished in completely supervised type for large school buildings with trouble bell alarm at master station to indicate any breakage in wiring or other derangement.

Also, plain open circuit type with master code or non-code, continuous ringing types for general alarm purposes and more moderate cost.

Break glass stations of hinged hammer type (no loose swinging hammers and chains) made for flush or surface mounting. Stations open with key for test purposes without breaking glass.

System can also be automatically tested each day before opening of school from program clock.



## ELECTRIC STOP CLOCKS

These are manufactured in a wide variety of types for accurate, split-second timing. Valuable in Science—Psychology and Gymnastic Courses.

## TELEPHONE SYSTEMS

Time saving equipment for quick, convenient communication between office and rooms or between rooms.

Standard school telephone equipment is extremely reliable because of its simplicity and good quality.

Uses same bells or buzzers that sound the program schedule, thus saving on signals and extra wiring.

Conversation between rooms can be supervised by principal's office.

Room phones may be watch case or long receiver types also arranged for flush mounting and with plug-in connector jacks for locking receivers in desk when not in use if desired. Operates on rectifiers without battery.



Above: Master Telephone Station



Room Telephone with Watch Case Receiver

## LABORATORY TEST PANELS

"Standard" Laboratory Panels and accessory equipment perform an important function both in scientific laboratory instruction and in vocational training in electricity.

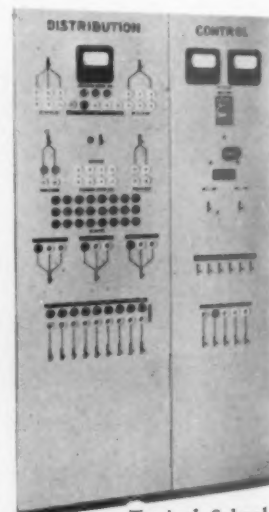
They provide a flexible, convenient method for distributing various voltages and types of current to tables and benches.

Connection changes can be rapidly made.

Exclusive features include jack construction, perfect contact, colored for ready selection in various voltages, sectional battery charging, and convenient table receptacles.

Standard laboratory equipment increases students' interest in laboratory and shop work, as well as facilitating the instructor's program.

We will design and manufacture panels arranged to satisfactorily meet all school and college requirements for Physics, General Science and vocational purposes.



Typical School Laboratory Test Panel

# THE WARREN TELECHRON COMPANY

Manufacturers of *Telechron*<sup>\*</sup> Timekeeping Systems for Modern Schools

General Office and Factory — Ashland, Mass.

## SALIENT FEATURES OF TELECHRON TIMEKEEPING SYSTEMS

- I. Quiet operation.
- II. No local master clock required.
- III. Operate direct from the regulated alternating current.
- IV. Available for 115 volt or 24 volt operation.
- V. Each timekeeper equipped with self-starting, sealed-in-oil rotor, bi-pole, synchronous motor.
- VI. No oiling, cleaning, winding or regulating.
- VII. Available for individual installation or as part of a Telechron centrally controlled system.
- VIII. Clocks available with sweep second hands.
- IX. Clock hands move continuously around the dial.
- X. National Board of Fire Underwriters' approved type construction throughout.

Your Architect has SWEET'S ARCHITECTURAL CATALOG Giving Complete Specifications



CLASSROOM CLOCK



CLASSROOM CLOCK



CLASSROOM BUZZER



CORRIDOR BELL

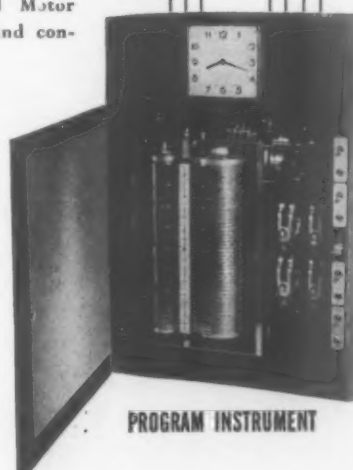


YARD GONG

Typical Telechron MDMR (Manual Dual Motor Reset) System for a school, with signals and control board

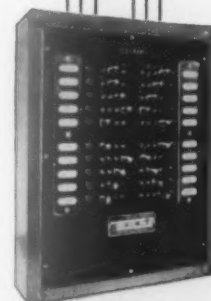


CENTRAL CONTROL



PROGRAM INSTRUMENT

SIGNAL SUPPLY



SIGNAL CONTROL BOARD

TO AC SUPPLY

<sup>\*</sup> Telechron is the trade-mark, registered in U. S. Patent Office, of Warren Telechron Company.

# ART CRAFT THEATRE EQUIPMENT CO.

108 West 46th Street • New York City

An ART CRAFT Installation  
Collins Hall  
FORDHAM UNIVERSITY

Center stage proscenium, 21' high by 32' wide by 30' deep. Completely equipped with rope and counter balance rigging.

Two-side stages, size, each, 12' x 12' x 21' high.

Side curtains operate on circular tracks. When drawn open, they form an unusual setting.



Architects:  
O'CONNOR & DELANY  
New York City

## RENTALS

We maintain a complete rental department.

It is frequently expedient to rent a curtain or back drop for a special scene.

If your school production requires additional drops or cycloramas — velour, satin or painted drops — advise us your requirements.

★

Write for Circular "A"

## COMPLETE STAGE EQUIPMENT

CYCLORAMAS—  
STAGE CURTAINS  
WINDOW DRAPERIES  
ASBESTOS CURTAINS  
GROUND CLOTHS  
PAINTED EXTERIORS  
LIGHTING EQUIPMENT  
STAGE HARDWARE  
WOOD TRACKS  
STEEL TRACKS  
MOTOR CONTROLS  
PICTURE SCREENS  
RIGGING, INSTALLED  
VELOUR ROPE RAILING

## REQUIREMENTS FOR QUOTATIONS

1. Width and height of proscenium.
2. Height from stage floor to ceiling.
3. Depth of stage.
4. Width on stage.

★

Upon receipt of measurements, samples and price will be mailed at your request.

## SERVICE

All inquiries are given prompt attention. ART CRAFT can help solve your technical problems. No obligation.

Take advantage of our many years of experience in manufacturing stage equipment.

Our work is thorough, prompt. Our interest in your success is constant. Therefore you will find our services useful and beneficial.

THE AMERICAN SCHOOL AND UNIVERSITY—1944



# AUTOMATIC DEVICES COMPANY

1037 Linden Street, Allentown, Pa.

EXPORT DEPARTMENT—220 W. 42nd Street, NEW YORK, N. Y., U. S. A.

DIRECT FACTORY REPRESENTATIVES

CHICAGO, ILL., N. C. Nussbaumer, 1050 N. Humphrey Avenue, Oak Park, Ill.

ST. LOUIS, MO., A. M. Pollack, 1310 Midland Drive

## PRODUCTS

"Silent-Steel" Heavy Duty Curtain Track.

"Besteel" Medium Duty Curtain Track.

"Steelite" Light Duty Curtain Track.

"Aerial" Type Unit-Combination Track and Machine:  $\frac{1}{3}$  hp.

"Silver Service" High Speed Curtain Machine:  $\frac{1}{2}$  hp.

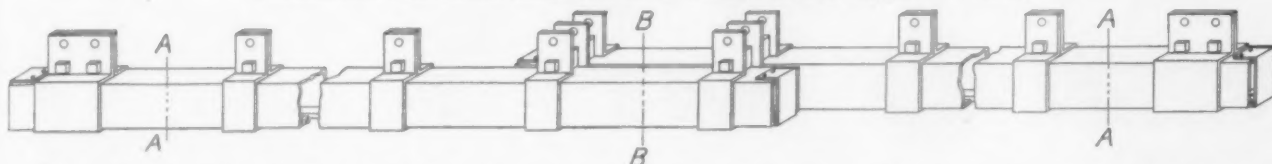
"Autodrape" Standard Curtain Machine:  $\frac{1}{3}$  hp.

"Autodrape" Special Curtain Machine:  $\frac{1}{4}$  hp.

"Stabilarc" Motor-Generator for Projection Arc Supply.

## CURTAIN TRACKS

Turnbuckles, Pipe-Batten Hangers, Wall or Ceiling Brackets Supplied as Desired

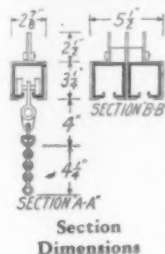


To Determine Gross Length of Track Required—As a basis, start with the clear width of opening which curtain is to uncover; i.e., distance between inside edges of curtain halves when in open position. Add 10% for lap at center for curtain when closed. Add 10% for extension on each end to accommodate each half of curtain when in open position. Total addition is 30%.

Example: Open curtain is to expose 30 ft. clear width. Add total of 30% or 9 ft. for center lap and both end extensions. Specify 39 ft. gross length, in two sections each 19 ft. 6 in.

## "SILENT-STEEL" HEAVY DUTY CURTAIN TRACKS

For Any Length—with Curtain of Any Weight



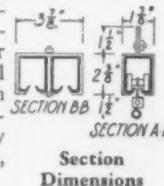
Suggested Specifications—Curtain tracks shall be of full-steel construction, 14-gauge, entirely enclosed, except for slot in bottom, each half to be one continuous piece and free of any riveted, welded or other mechanical joints regardless of length, except at center lap. Each curtain carrier shall be supported on ball bearings by two special composition rubber wheels rolling on two separate parallel treads, and all pulley blocks equipped with steel ball bearing wheels adequately guarded; Model No. 280 as manufactured by

Automatic Devices Company of Allentown, Pa.

## "BESTEEL" MEDIUM DUTY CURTAIN TRACKS

For Lengths up to 36 Ft.—with Light or Medium Weight Curtains

Suggested Specifications—Curtain tracks shall be of full-steel construction, 14-gauge, entirely enclosed, except for slot in bottom, each half to be one continuous piece and free of any riveted, welded or other mechanical joints regardless of length, except at center lap. Each curtain carrier shall be of cadmium-plated steel construction supported on self-lubricating bearings by two special composition rubber wheels rolling on two separate parallel treads, and all pulley blocks equipped with steel, ball-bearing wheels adequately guarded; Model No. 170 as manufactured by Automatic Devices Company of Allentown, Pa.



## AUTOMATIC CURTAIN MACHINES

### "Autodrape" Curtain Machines

All "Autodrape" machines are equipped with exactly the same gear reduction unit, base and automatic reversing switch mechanism, including the following features:

(1) Limit Switch Arrangement—Adjustment for "open" and "close" positions reduced to simplest form.

(2) Elevator Type Traction Drive—Maximum delivered power without slippage.

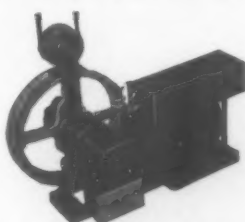
(3) Mounting—Endless cable design allows installation of machine at any position in vertical plane of track.

(4) Disconnecting Clutch—For conversion to hand operation.

(5) Automatic Overload Protective Breaker—Protects machine against excessive loads.

(6) Motor— $\frac{1}{4}$  or  $\frac{1}{3}$  hp., single phase.

(7) Speed—92 or 115 ft. per minute, equivalent to curtain separation of 2 $\frac{1}{2}$  or 3 $\frac{1}{2}$  ft. per second, respectively (based on 60-cycle current).



"Autodrape" Standard Model

Over-all dimensions: 19 $\frac{1}{2}$  in. long, 10 in. wide, 15 $\frac{1}{2}$  in. high

$\frac{1}{2}$ -hp. motor delivering a cable speed of 125 or 155 ft. per minute equivalent to curtain separation of 4 or 5 ft. per second.

Recommended for use with "Silent-Steel" tracks up to about 80 ft. gross length.

### "Silver Service" Curtain Machine

This model has all the features of the "Autodrape" Standard Machine. It is equipped with

## REPRESENTATIVE INSTALLATIONS

### Public Schools

New York, N. Y.  
Philadelphia, Pa.  
Baltimore, Md.  
Cleveland, Ohio  
Washington, D. C.  
Newark, N. J.  
Buffalo, N. Y.  
Seattle, Wash.  
Providence, R. I.  
Pittsburgh, Pa.  
Sacramento, Cal.

### Theatre Circuits

Paramount-Publix  
Warner Bros.  
Balaban & Katz  
R-K-O  
Loews  
Fox  
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### Colleges

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U. S. Military  
Academy  
Swarthmore  
University of Maine  
New York University  
City of New York  
Connecticut College  
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### Miscellaneous

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For Complete Information and Samples of Track write to Automatic Devices Company, Allentown, Pa.

THE AMERICAN SCHOOL AND UNIVERSITY—1944

# CAPITOL STAGE LIGHTING COMPANY

E. ALTMAN, Proprietor

Distributed Abroad by  
**WESTERN  
ELECTRIC  
EXPORT CO.**

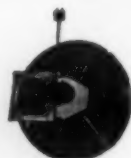
Subsidiary of  
**WESTERN ELECTRIC  
COMPANY**

527-529 West 45th Street, New York 19, N. Y.

Cable Address: CAPCOLITE, New York

Manufacturers of complete

Stage Lighting Apparatus for the Theatre,  
Production, Amateur Theatricals, Schools,  
Churches, Community Center, Little  
Theatres, Halls, Etc.



Aisle Lights  
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Automatic Colorwheels  
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Switch Boxes  
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Scenic Effects  
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Signs  
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Switchboards  
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Wall Pockets  
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Etc.



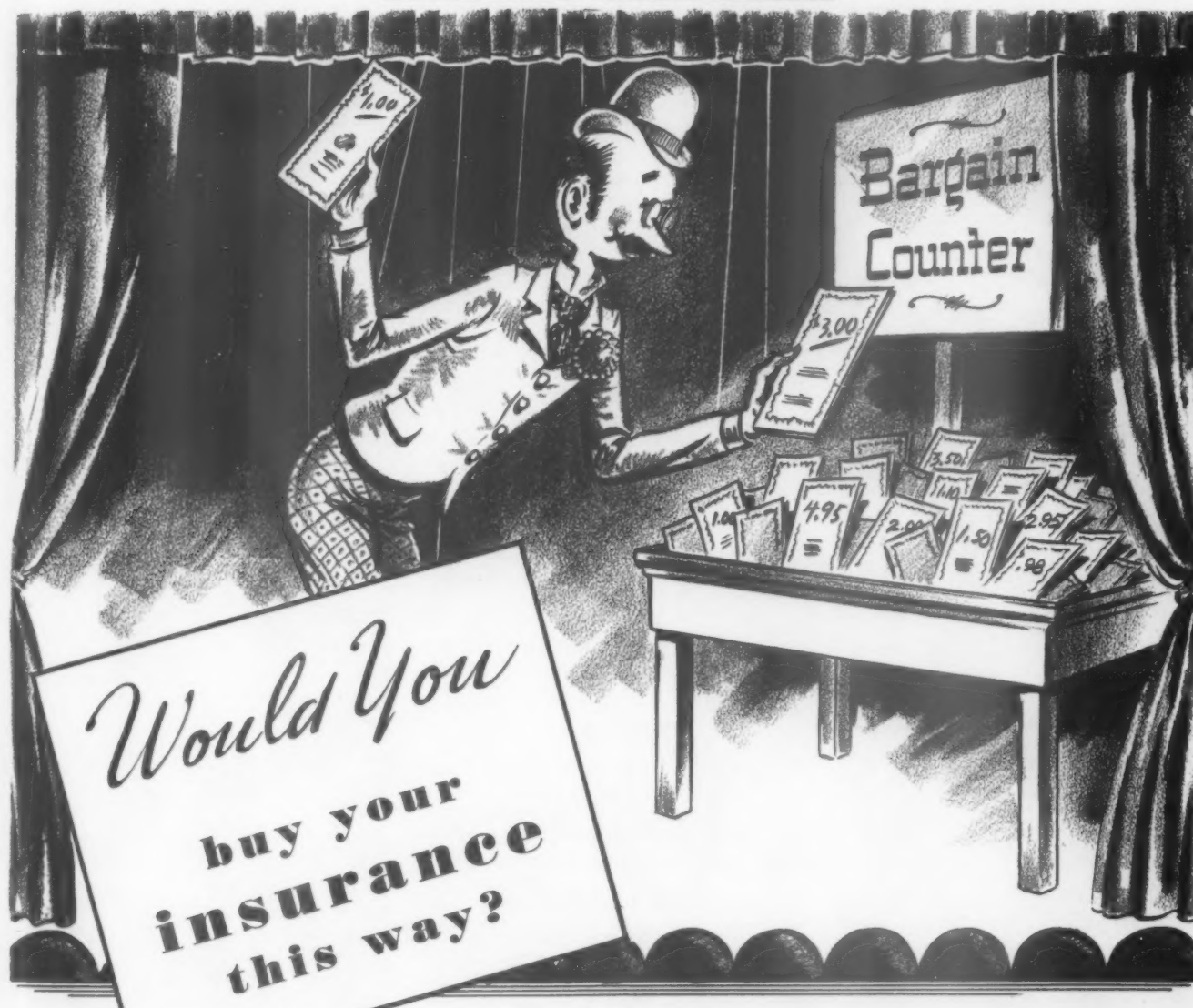
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# J. R. CLANCY, INC.

Syracuse, New York

Designers and Builders of Stage Mechanical Equipment



The law protects you against misrepresentation when you buy insurance, but you are on your own when accepting stage equipment offered as "just as good."

In equipment for your stage, quality is almost synonymous with safety. A slight shaving of the former, for competitive advantage, may mean the difference between safety and danger for performers or spectators.

Clancy stands out in the stage equipment

field because quality has never been sacrificed to meet a competitive bid. We consider Clancy's greatest asset the confidence that has accrued to them as a result of this policy.

If you are planning an auditorium, let Clancy engineers help. They have been designing, building and providing such equipment for theatres, convention halls, motion picture houses and school auditoriums for 58 years. Consultations involve no obligation.

**COMPLETE SERVICE FOR STAGES OF ALL TYPES**

THE AMERICAN SCHOOL AND UNIVERSITY—1944

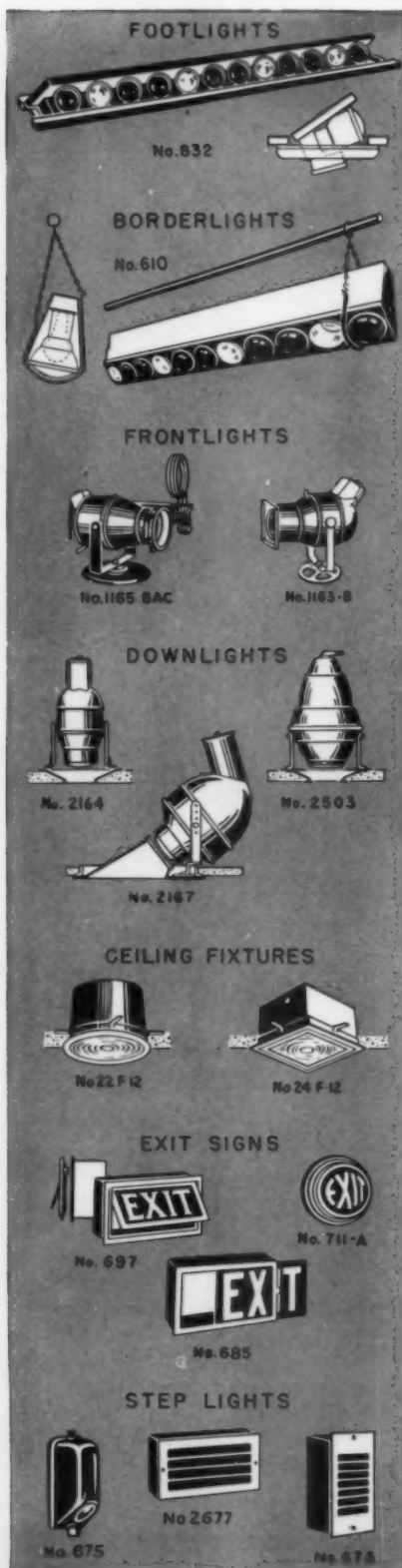


Originators and  
Manufacturers of  
"KLIEGLIGHTS"

# KLIEGL BROS.

UNIVERSAL ELECTRIC STAGE LIGHTING CO., INC.  
EST. 1896  
STAGE and AUDITORIUM LIGHTING

321 West 50th Street,  
New York 19, N. Y.  
Tel. COLUMbus 5-0130



**D**OING OUR BEST . . . under war time restrictions to keep you supplied with essential requirements during the emergency.

Many of our products heretofore limited to military needs are now available on preference rated civilian orders.

When victory is won and peace restored we will be ready and eager to fill your normal demands; and prepared to offer the latest in new developments in stage, auditorium, and architectural lighting.

## POST-WAR PLANS

While your plans for the future are being formulated we can help you with our specialized knowledge and technical data . . . assist you to incorporate the most practical ideas and latest lighting developments in your post-war construction and improvements.

## PRODUCTS

Stage lighting equipment of every description, including color lighting accessories, stage effects, and supplies. General lighting equipment such as: aisle lights, exit signs; inbuilt fixtures, cove strip lights, floodlights, et cetera. Also special lighting devices for unusual requirements.

## SERVICES

Ample facilities and an experienced staff assure satisfactory fulfillment of commitments. Our engineers are available for consultations in the selection of equipment or preparation of layouts.

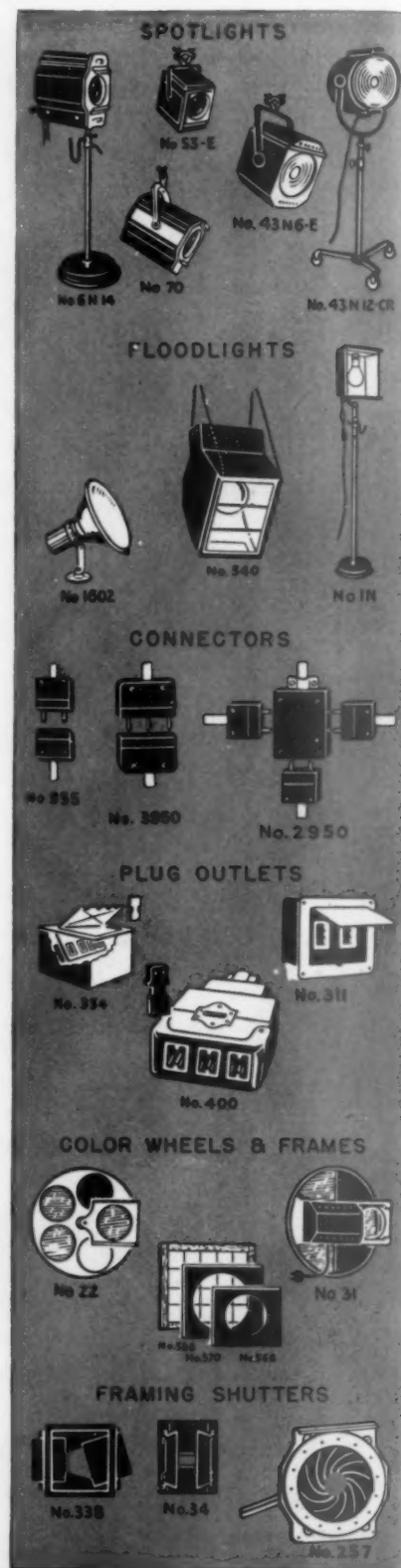
## INQUIRIES

Information regarding our products or suggestions as to their installation and use furnished on request. Your inquiries regarding present or post-war needs are cordially invited.

## KLIEGLIGHTS

High intensity beam projectors with ellipsoidal reflectors, lens system, and coordinated shutter arrangement which permits regulation of size and shape of light beam.

Portable units have an in-built four-way shutter system, with external controls to facilitate quick and easy adjustments. Permanently installed units have a drop-in shutter arrangement. Full particulars on request.



## KNOXVILLE SCENIC STUDIOS

609-611 Phillips Avenue  
Knoxville, Tennessee



Whatever your stage problems are or requirements may be, we welcome the opportunity of serving you. Our long experience in the furnishing of complete stage equipment enables us to offer you a service of the highest professional type.

We will gladly help you prepare specifications, furnish drawings and blueprints, and give you free estimates on your stage equipment.

- VELOUR CURTAINS
- CURTAIN TRACKS
- OLIO CURTAINS
- CYCLORAMAS
- AUDITORIUM DRAPES
- PAINTED DROPS
- AND SETTINGS
- CYKE PROPS
- INTERIOR FLATS
- LIGHTING EQUIP.
- STAGE HARDWARE
- AND RIGGING

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Write us for our new illustrated Catalog of  
"STAGE SCENERY  
AND EQUIPMENT"

Samples, Designs and Blueprints — Sketches furnished for all jobs, large or small.

We carry a large stock of materials at all times and can give immediate service.

# "DISTINCTIVE STAGE EQUIPMENT"

THE AMERICAN SCHOOL AND UNIVERSITY—1944

# MORK-GREEN STUDIOS INC.

Creators of

Distinctive Stage Equipment

243 W. Congress Street  
DETROIT, MICHIGAN

1126 Chimes Building  
SYRACUSE, N. Y.

## STAGE SETTINGS BY MORK-GREEN

Mork-Green stage settings, in harmonizing, interesting designs, serve as a frame for performances, magnifying the best efforts of the teachers and the pupils.

Whether you use the school stage for a student speaker or for a play with a big cast, your students are at their best with a background of Mork-Green draperies.

Our stage settings help bring out the latent talent of the students, increase their interest, and make for a keener competition among them in their efforts to present outstanding entertainment, as well as first-class productions of a more serious nature.

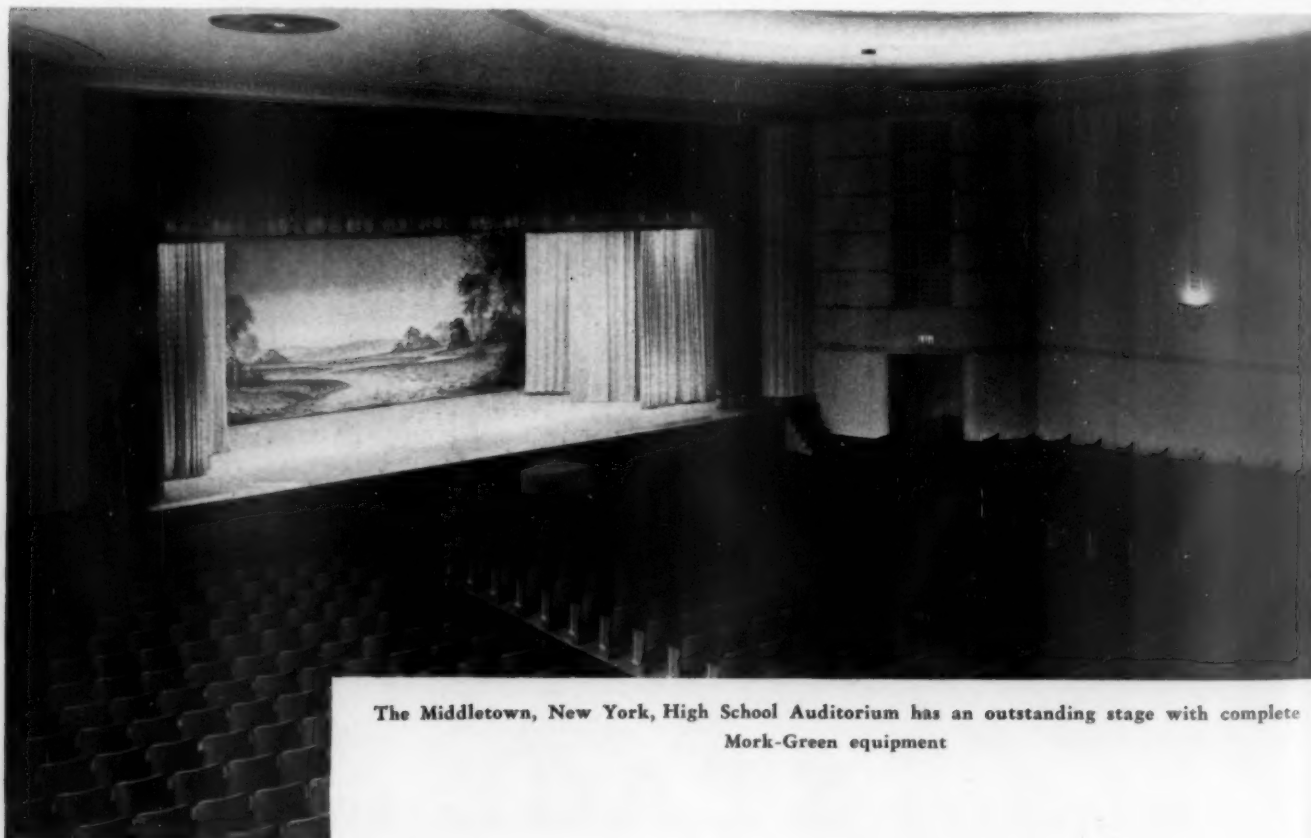


VELOUR CURTAINS  
CURTAIN TRACKS  
CURTAIN CONTROLS  
PAINTED EXTERIORS  
CYCLORAMAS  
AUDITORIUM DRAPES  
ELECTRICAL EQUIPMENT  
STAGE HARDWARE  
PICTURE SCREENS  
SCENERY FOR RENT  
RIGGING

## SCHOOL INSTALLATIONS BY MORK-GREEN

Michigan State College Auditorium, East Lansing, Michigan  
New Denby High School, Detroit, Michigan  
New McKenzie High School, Detroit, Michigan  
Arthur Hill High School, Saginaw, Michigan  
New High School, Midland, Michigan  
J. W. Sexton High School, Lansing, Michigan  
Indiana University, New Theatre and Hall of Music, Bloomington, Indiana  
Westinghouse High School, Pittsburgh, Pennsylvania  
New Grafton High School, Grafton, West Virginia  
New High School Auditorium, Morgantown, West Virginia  
Castle Heights Military Academy, Lebanon, Tennessee  
Middletown High School, Middletown, New York  
Livingston Manor Central School, Livingston Manor, New York  
Marcellus Central School, Marcellus, New York  
Auburn High School, Auburn, New York  
Thomas R. Proctor High School, Utica, New York  
Newark High School, Newark, New York  
Jamestown High School, Jamestown, New York  
Schools No. 29 and No. 38, Rochester, New York  
Lincoln Junior High School, Syracuse, New York  
Eden Central School, Eden, New York  
Kenmore High School, Kenmore, New York

(A LIST OF INSTALLATIONS LOCATED CLOSER TO YOUR CITY WILL BE FURNISHED ON REQUEST)



The Middletown, New York, High School Auditorium has an outstanding stage with complete Mork-Green equipment

THE AMERICAN SCHOOL AND UNIVERSITY—1944



# THE ANSTICE CO., INC.

111 Humboldt St., Rochester 9, N. Y.

## STERLING PEELERS

*First*  
Mechanical Vegetable  
Peeling Machine

★

*First*  
In Peeling Speed

★

*First*  
In Peeling Efficiency

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*First*  
Streamlined Design

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*First*  
Choice of Most  
Schools and Colleges



## STERLING

### DISHWASHERS

Proven  
Dependability

★

Safe  
and Easy Operation

★

High Efficiency

★

Low Operating Cost



★ The STERLING line of peelers possesses many additional "firsts" and exclusives, including Hingeless Cover for extra safety; no exposed moving parts—can be operated safely by the most inexperienced person; and, of tremendous importance in many applications, it is the **only** Stainless Steel peeler.

★ Sterling Peelers are available to meet every peeling requirement. The table below indicates the various sizes available and the approximate number of pounds of potatoes which can be peeled per hour.

Size	Floor Space Required	Discharge Height	Lbs. Peeled Per Hour Raw
15 lb.	15" x 15"	All models built to discharge directly into any standard vegetable sink	225 lbs.
30 lb.	18" x 18"		500 lbs.
45 lb.	22 1/2" x 22 1/2"		900 lbs.
60 lb.	" x "		1200 lbs.
70 lb.	" x "		1400 lbs.

NOTE: Approximately one pound of potatoes before being peeled will give two or three servings mashed potatoes.

★ Many schools, colleges, and other large institutions have ordered and re-ordered STERLING dishwashers many times. STERLING proven **dependability**, direct result of the simple, rugged STERLING design, finest materials, and careful workmanship, is an important reason for these repeat orders. In addition, STERLING'S safe and easy operation, high efficiency (as near germ-free dishes as can be achieved), and low operating costs are also important considerations.

The above illustrated dishwasher is one of the most popular machines used in schools, hospitals, etc.

The following table gives information as to capacities of this and other models—

Model	Pieces Per Hour	Meals Average Cafeteria Service
DS-50 1 tank	4,000	500
C-1-A 1 tank	6,500	800
C-2-A 1 tank	9,500	1,100
2-A-60 2 tanks	8,500	1,000
2-A-100 2 tanks	10,000	1,250
2-A-175 2 tanks	15,000	1,500
2-A-250 2 tanks	20,000	2,000

COMPLETE INFORMATION INCLUDING CATALOGS AND SPECIFICATION SHEETS FURNISHED ON REQUEST FOR BOTH PEELERS AND DISHWASHERS, ALSO FOR THE COMPLETE LINES OF STERLING DICERS AND BURNISHERS.

# S. BLICKMAN, INC.

Manufacturers of Food Service Equipment for Schools and Institutions



3400 Gregory Ave.  
WEEHAWKEN, N. J.



A Typical Blickman Cafeteria Installation

## A 3-Way Service FOR MASS FEEDING INSTALLATIONS

**1 ENGINEERING and LAYOUT:** Our experts are trained to evaluate the specific requirements of a particular establishment and to arrange space and equipment for most efficient operation. On approved contracts, our service includes related planning, manufacture and installation of complete units — from the small pantry or service counter to the large kitchen serving thousands of individuals.

**2 DESIGN and FABRICATION of INDIVIDUAL UNITS:** BLICKMAN engineers carefully design each item to carry out its function efficiently. Our units are noted for their welded round-corner construction — providing sanitary, crevice-free surfaces. They are easy to clean, durable and attractive in appearance.

**3 THE "KNOW-HOW" IN BUILDING FINE FOOD SERVICE EQUIPMENT:** For over 50 years, S. BLICKMAN, INC. has specialized in the planning and manufacture of food service installations for every need. Our factory is one of the largest of its kind. Experienced mechanics work with modern tools to give you the finest in food service equipment.

### INDIVIDUAL ITEMS OF FOOD PREPARATION AND FOOD SERVICE UNITS Include:

Automatic Electric Hot Food Storage Tables	Dish Heaters	Pantry Cabinets and Cupboards	Storage Bins and Closets
Bain Maries	Dish Tables	Plate Warmers	Tray Trucks
Cabinets	Dish Warmers	Preparation Tables	Utility Trucks
Cafeteria Counters	Food Conveyors	Range Hoods	Urn Stands
Cereal Cookers	Food Trucks	Service Units	Warmers
Coffee Urns	Kitchen Cabinets	Sinks	Water Coolers
Cooks Tables	Pan and Pot Racks	Steam Tables	Work Tables

Special equipment built to specifications • Orders subject to Government priority regulations

Send for this folder  
on Food Service Equipment



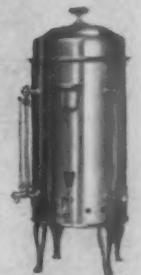
WORK TABLES



SINKS



DISH TRUCKS



COFFEE URNS



STEAM TABLES



BAKERS' TABLES

FROM A SINGLE UNIT TO A COMPLETE INSTALLATION

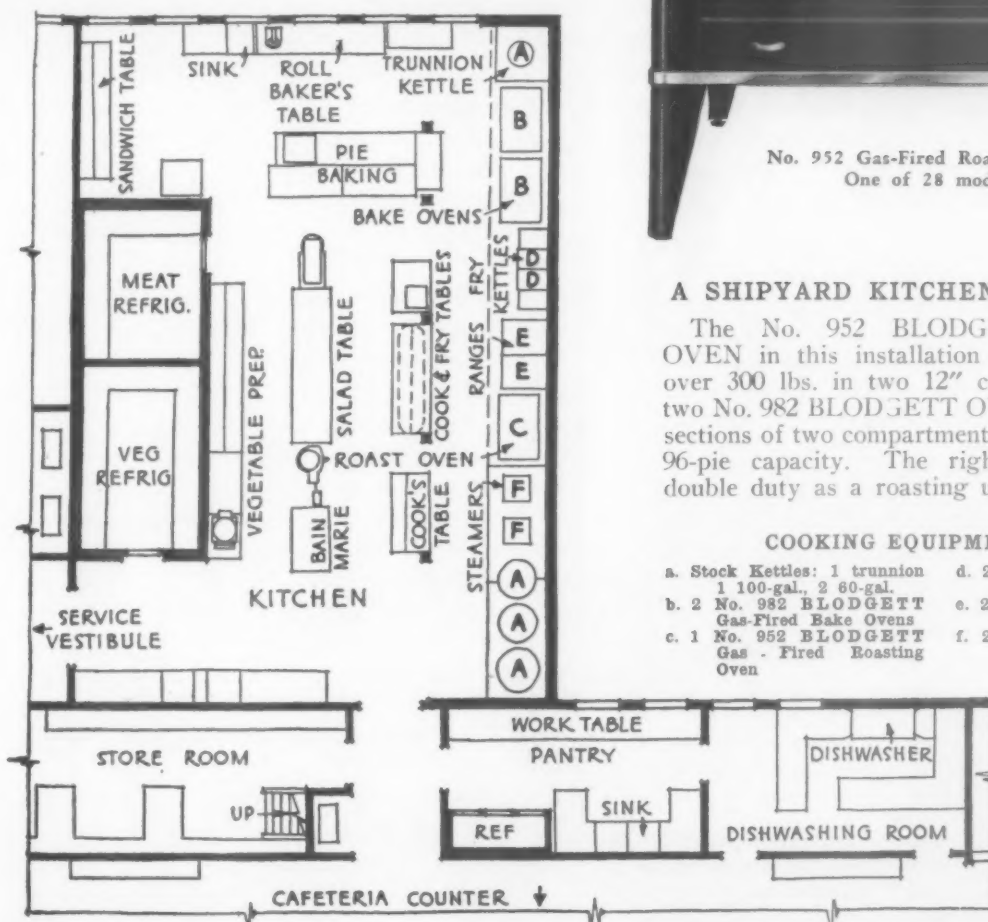
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# THE G. S. BLODGETT CO., INC.

53 Maple Street, Burlington, Vermont

## SUCCESSFUL MASS-FEEDING OPERATIONS CALL FOR BLODGETT ROASTING & BAKING OVENS

Basic menu production is simplified, its quality assured, with this efficient, modern equipment. Sectional construction and individual heat control assure flexibility and economy. And oven-cooking reduces losses due to shrinkage and spoilage and makes left-overs more varied and palatable.



No. 952 Gas-Fired Roasting Oven  
One of 28 models

### A SHIPYARD KITCHEN FEEDING 3600

The No. 952 BLODGETT ROASTING OVEN in this installation has a capacity of over 300 lbs. in two 12" compartments. The two No. 982 BLODGETT OVENS provide four sections of two compartments each, with 16-pan, 96-pie capacity. The right-hand oven does double duty as a roasting unit.

#### COOKING EQUIPMENT USED

- |   |                         |
|---|-------------------------|
| a. Stock Kettles: 1 trunnion<br>1 100-gal., 2 60-gal. | d. 2 Fryers             |
| b. 2 No. 982 BLODGETT<br>Gas-Fired Bake Ovens         | e. 2 Ranges             |
| c. 1 No. 952 BLODGETT<br>Gas-Fired Roasting<br>Oven   | f. 2 Vegetable Steamers |

CIVILIAN  
OVEN USERS  
MAY BUY  
NEW OVENS  
UNDER ORDER

L-182

Designed by Glenn Osgard of Stouffer's Restaurants  
for Chas. M. and Edward Stotz, Architects-Engineers



Write today for "Case Histories  
of Successful Mass Feeding Oper-  
ations" and "The Role of the  
Roasting Oven in Mass Feeding"

**THE G. S. BLODGETT CO., INC.**  
53 MAPLE STREET, BURLINGTON, VERMONT  
**BLODGETT** — Makers of Fine Ovens Since 1848

THE AMERICAN SCHOOL AND UNIVERSITY—1944



# CHAMPION DISH WASHING MACHINE CO.

MAIN OFFICE AND FACTORY

Erie 1, Penna.

**CHAMPION DISH WASHING MACHINES ARE NOTED FOR MORE THOROUGH WASHING, AND UNEQUALLED DEPENDABILITY IN HARD SERVICE**

**Faster, More Thorough Washing.** The Champion's direct forceful sprays have the combination of pressure-plus-volume that gives the speediest washing action obtainable.

**Assurance Against Interruptions.** The Champion's clean-cut simple design, and extra ruggedness of construction, have given thousands of institutions Unequalled Dependability in their dishwashing.

Under War Production Board restrictions, dish washing machines have been limited to three sizes and two types, galvanized iron only: Rack type, single tank or double tank, hand feed or automatic feed, up to a maximum of 3 H.P. Integral vent hoods, to carry off steam, can be provided.



400-D Champion, Conveyor Belt Type

For more than 50 years Champion has been noted for dishwashing machines "Built Like a Battleship," with extra strength at all critical points. Champion's higher standards of workmanship and design are worth a lot of money to the user.

**Proved by Results.** We suggest that you inquire of officials in other schools, and find out how the Champion's performance has compared with that of other machines. Our long list of school and university installations will enable you to get, direct from users, data on the Champion's more thorough washing and more economical operation.

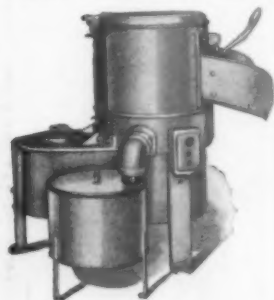
**Write us for help, when you are planning improvements.** We'll gladly help you lay out your dishwashing pantry.

No matter how difficult your problem, our engineers can very likely solve it. An important part of Champion service is to assist you in laying out the space you have available for dishwashing, to save time, and give you lowest possible operating cost.

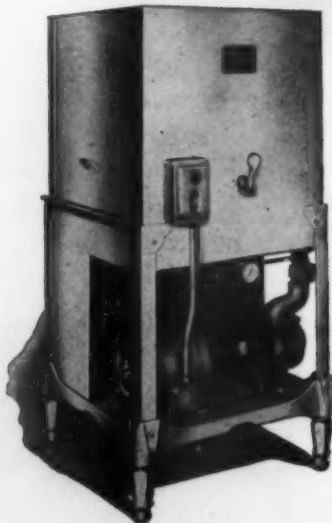
Our experience—more than 50 years in the manufacture of dishwashing machines—has proven valuable to many school officials. Why not use it?

★

**Have You Seen the New Champion Peeler?** It's an exceptionally efficient machine—the one you want for Fastest Peeling and Easiest Maintenance. Write for description.



(Above)—2-Tank, Automatic Feed Champion Built to W.P.B. Specifications.



(At left)—Single Tank, Hand Feed Champion Built to W.P.B. Specifications.

★

For further information on Champion machines, and their availability under W.P.B. restrictions, consult your equipment dealer.

# THE CLEVELAND RANGE CO.

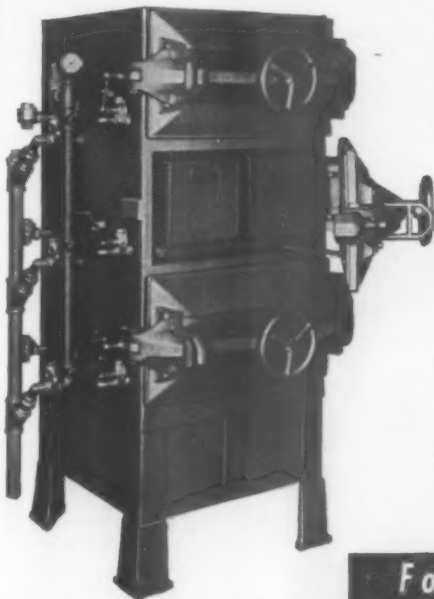
Cleveland, Ohio

## STEAM-CHEF STEAM COOKERS

for all School, College and Institution Kitchens. Direct Steam—Gas—Electric Operation

**STEAM COOKING** results in more nourishing and appetizing vegetables and other foods, because those elements which provide both vitamins and flavor are better **retained** through the steaming process. Soluble nutrients are preserved, as the food is cooked without water, and the oxidation of essential food values is avoided because of the absence of air in the cooking compartments. In hundreds of leading educational institutions **STEAM-CHEF** also saves time, space, work and fuel. It is simple to operate, always ready for use, frees your range top for other purposes, and can be used for a great variety of foods. Many **STEAM-CHEF** owners use them for canning seasonal fruits and vegetables. There is a **STEAM-CHEF** model of the correct size and type to fit your exact cafeteria requirements. Some connect directly to a central steam line. Others generate their own steam with gas or electricity. For **better** cooking **STEAM**. For **best** steaming—**STEAM-CHEF**!

Send for valuable booklet "Getting the Most from Steam Cooking"



Model 101-3B, Direct-connected typical 3 compartment style. The most popular size for average requirements. Capacity 6 bushels

**Body Construction** — One-piece welded bodies of heavy plate steel, rust-proofed or stainless, easy to keep clean and sanitary, insuring low maintenance cost and extra-durability.

**"Full Floating" Doors**—An exclusive Steam-Chef feature, always seat perfectly, never require adjustments, prolong gasket life.

**Safe Operation**—Maximum safety results from doors which cannot be opened while steam is being admitted to compartment.

**Synchronized Thermostatic Control**—Achieves new economy and convenience. Eliminates necessity for steam vent line and cuts steam consumption 50% to 80%.

**Automatic Control**—of both fuel and boiler water level is provided on gas and electric units—an exclusive feature, effecting fuel saving of 33⅓%.

**Sizes and Types**—Over 50 models, sizes and types—capacities 2 to 7½ bushels per charge—standard units to fit practically any requirement.



Model 2SB, Steam-generating, gas operated, two compartment. Also available in direct-connected type Model 101-2B. Capacity 4 bushels

For **BETTER** Steaming-  
**STEAM-CHEF**

### PROMINENT SCHOOL INSTALLATIONS

Tuskegee Institute, Tuskegee, Ala.  
Alabama Polytechnic Institute, Auburn, Ala.  
Arizona State Teachers College, Tempe, Ariz.  
Phoenix Union High School, Phoenix, Ariz.  
Stanford University, Palo Alto, Calif.  
Central Trade School, Oakland, Calif.  
Mark Keppel High School, Alhambra, Calif.  
Garfield High School, Los Angeles, Calif.  
Louis Pasteur Jr. High School, Los Angeles, Calif.  
Colorado Springs High School, Colorado Springs, Colo.  
Robbins College, Wintorspark, Fla.  
John B. Stetson University, Reland, Fla.  
Georgia School of Technology, Atlanta, Ga.  
Northwestern University, Evanston, Ill.  
University of Idaho, Moscow, Idaho  
Purdue University, Lafayette, Ind.  
University of Indiana, Bloomington, Ind.  
Louisiana Polytechnic Institute, Ruston, La.  
University of Michigan, Ann Arbor, Mich.  
University of Minnesota, Minneapolis, Minn.  
Michigan State College, East Lansing, Mich.

University of Maine, Orono, Me.  
Brooks School, Andover, Mass.  
Carroll College, Helena, Mont.  
University of Nebraska, Lincoln, Neb.  
Cranwell Preparatory School, Lenox, Mass.  
Dartmouth College, Hanover, N. H.  
Cornell University, Ithaca, N. Y.  
Syracuse University, Syracuse, N. Y.  
Vassar College, Poughkeepsie, N. Y.  
University Dining Halls, Princeton, N. J.  
University of New Mexico, Albuquerque, N. M.  
Hunter College, New York, N. Y.  
Fordham University, New York, N. Y.  
Duke University, Durham, N. C.  
Skidmore College, Saratoga Springs, N. Y.  
Brooklyn School for Home Making, Brooklyn, N. Y.  
Port Richmond High School, Richmond Borough, N. Y.  
State Teachers College, Minot, N. D.  
Ohio State University, Columbus, Ohio  
University of Tulsa, Tulsa, Okla.  
University of Oregon, Eugene, Ore.

Northeast High School, Oklahoma City, Okla.  
University of Akron, Akron, Ohio  
Central High School, Oklahoma City, Okla.  
Mellon Jr. High School, Mt. Lebanon, Pa.  
Bryn Mawr College, Bryn Mawr, Pa.  
Allegheny College, Meadville, Pa.  
Bucknell University, Lewisburg, Pa.  
University of South Carolina, Columbia, S. C.  
University of Texas, Austin, Texas  
University of the South, Sewanee, Tenn.  
A. & M. College of Texas, College Station, Texas  
Brigham Young University, Salt Lake City, Utah  
Emory & Henry College, Emory, Va.  
Norwich University, Northfield, Vermont  
Davis-Elkins College, Elkins, W. Va.  
University of Wisconsin, Madison, Wis.  
Beloit College, Beloit, Wis.  
Lawrence College, Angleton, Wis.  
University of Wyoming, Laramie, Wyo.  
Bellingham High School, Bellingham, Wash.  
Everett High School, Everett, Wash.

[Complete information and detailed specifications will be furnished on request. Sold through recognized kitchen equipment dealers everywhere.]

THE AMERICAN SCHOOL AND UNIVERSITY—1944

# EDISON GENERAL ELECTRIC APPLIANCE COMPANY, INC.

5633 West Taylor Street, Chicago 44, Illinois

Commercial Electric Cooking Equipment

Boston : New York City : Atlanta : Cleveland : Chicago : Kansas City : Dallas : Los Angeles : Seattle : Salt Lake City  
CANADA — Canadian General Electric Company, Ltd., Toronto

...and in your Modernizing Plans

## Hotpoint is a Must

This equipment is especially suited for school cafeterias because of its ruggedness and dependability. **QUALITY** is built into all vital parts—heating units, switches, wiring and connections. If your present equipment is inadequate or beyond repair, consult your distributor or write Hotpoint. New government regulations now permit manufacture of a limited quantity of equipment for essential civilian use.

### AUTOMATIC ELECTRIC OVEN

Has three separate compartments, each with its own independent temperature control. Reaches 500° F. in 21 min. Model N-167 (illustrated) 70 in. high, 36 in. wide, 36 in. deep. Connected load 18 KW.



### "BRAWNY LAD" ELECTRIC RANGE

Built for hard service. Select combination of surface units to fit your needs. Hi-Speed Calrod units, Automatic Grid-dles, Hotplates. Large, all-purpose oven bakes four 9 inch pies. R-200 (illustrated) 32 in. high, 30 in. wide, 32 in. deep. Connected load 12 KW.



### "CUSTOM TOP" ELECTRIC RANGE

Select combination of surface units to fit your needs. Hi-Speed Calrod, "French" cast-in round units, two sizes of Automatic Grid-dles, large cast-in Hot-plates. R-171 (illustrated) 32 in. high, 36 in. wide, 38 in. deep. Connected load 21 KW.



### DEEP FAT FRY KETTLE

Hi-Speed Calrod heating units are immersed in the fat. No heat loss. Fat capacity, Model K-32 (illustrated) 25 lbs. 32 in. high, 20 in. wide, 24 1/2 in. deep. Connected load 7 KW.



For outstanding achievement



in War Production

THE KITCHEN  
OF TOMORROW  
WILL BE  
ALL-ELECTRIC

# Hotpoint Edison

COMMERCIAL ELECTRIC COOKING EQUIPMENT

RANGES • BAKE OVENS • ROASTING OVENS  
DEEP FAT FRY KETTLES • BROILERS • GRIDDLES

OLDEST AND LARGEST  
MANUFACTURERS OF  
ELECTRIC COOKING  
EQUIPMENT

FOR VICTORY — BUY U. S. WAR BONDS AND STAMPS

THE AMERICAN SCHOOL AND UNIVERSITY—1944



# ERSHLER & KRUKIN, INC.

Bayonne, New Jersey

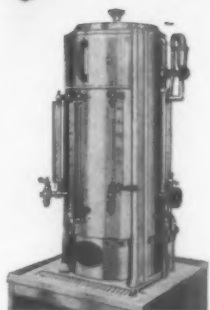
Manufacturers of Kitchen and Cafeteria Equipment for the Economical Preparation and Service of Food and Beverages



## THERMOLATOR EQUIPMENT FOR EVERY FOOD SERVICE NEED



HOT FOOD  
TABLES



URNS—GAS STEAM AND  
ELECTRICALLY HEATED



HOT FOOD STORAGE  
CABINETS



TRAY, DISH AND KITCHEN  
TRUCKS

Also general purpose, scullery and dish washing sinks; food conveyors; counters; gas electric combination units with food and plate warming sections; hot food storage and refrigeration units.



*Cafeteria, Howard Johnson Management, at Casey Jones School of Aeronautics, the largest school of its kind. Equipment designed and installed by Ersbler & Krukin, Inc.*

This complete cafeteria and kitchen is one of many food service layouts designed and constructed to meet today's school feeding needs. It is one of many cafeterias designed and installed by us in Princeton, Lehigh, Penn State, and other schools and colleges.

If you are planning postwar construction or remodelling, let our engineers assist you with their specialized knowledge gained from many years of experience.

We can supply individual standardized THERMOLATOR units for every cooking need or handle your complete installation.

*Write for full information about our complete School Cafeteria Service*

*High school cafeteria counter and food service equipment by Ersbler & Krukin, Inc.*

*Main kitchen; showing equipment designed and constructed by Ersbler & Krukin, Inc.*



## THE FORMICA INSULATION CO.

4614 Spring Grove Avenue, Cincinnati, Ohio

# *Plastic* RESTAURANT AND LIBRARY TABLE TOPS AND DESKS TOPS!

**F**ORMICA provides a plastic finish for many surfaces about the school. It is very desirable because it is sanitary and easy to keep clean; it is very resistant to spotting, staining, cracking or deterioration by ordinary use. There are many handsome colors and finishes.

### FORMICA RESTAURANT TOPS

In school restaurants, as in the overwhelming majority of other restaurants, Formica table tops are most widely used. They do not spot with ordinary liquids, do not chip or crack; they are sanitary and easily kept clean. They last for years without maintenance attention.

### LIBRARY TABLE TOPS

In libraries and reading rooms Formica tops are finding wide application. They were used in the Annex to the Library of Congress for this purpose and have been installed in many schools and universities. "Realwood" Formica consisting of veneers of genuine wood cured into the plastic sheet—and obtaining thereby all the characteristics of a plastic—are available for this purpose.

### SCHOOL ROOM DESK TOPS

No other finish can provide more attractive tops for study desks than Formica. It resists many forms of abuse that ruin the appearance of ordinary desks. It is easy to clean; stable in color; non-absorbent, not easily cracked or broken.

Formica is used for lobby wall paneling, for counter and table tops, desk tops in business offices and for many other similar uses. Literature with color suggestions and a complete discussion of the characteristics of the material is available on request.

● Desk tops of Formica (linen finish) in a room of the Crowe Island School, Winnetka.



● Formica table tops in a linen finish installed in a vocational school by the Chicago Board of Education.



● Formica table tops in a study room of the Crowe Island School, Winnetka, Ill. Specified by Eliel and Eero Saarinen.



# FORMICA

**FOR FURNITURE FIXTURES AND BUILDING PURPOSES**

THE AMERICAN SCHOOL AND UNIVERSITY—1944

# THE HOBART MANUFACTURING CO.

Makers of Electric Food-preparing and Dishwashing Machines for  
Commercial and Institutional Kitchens and Bakeries

Troy, Ohio

ATLANTA, 336 Marietta St., N.W.  
CHICAGO, 61 Wacker Drive  
DALLAS, 2034 Commercial St.

LOS ANGELES, 412 S. Los Angeles St.  
NEW YORK, 71 Madison Ave.  
SAN FRANCISCO, 929 Mission St.

ST. LOUIS, 4217 N. Grand  
SEATTLE, 2208 Second Ave.  
CANADA: Head Office, 119 Church St., TORONTO

SALES AND SERVICE OFFICES IN ALL PRINCIPAL CITIES (Consult Telephone Directory)

**HOBART FOOD MACHINES ARE SOLD THROUGH LEADING KITCHEN OUTFITTERS**

With proper approval schools are eligible to purchase kitchen machines. If you are doubtful about your status write us and we will advise you regarding your possibilities of obtaining Hobart Kitchen Machines.

## GUARANTEE AND SERVICE

All Hobart Machines are fully guaranteed and serviced by one nation-wide organization. This avoids uncertainty, confusion, and money-losing delays—and greatly simplifies the purchase and maintenance of all machines used in your kitchen.

Illustrations show representative models only. Each line of Hobart Machines includes a range of sizes to fit any application, from the smallest to the largest school kitchen. Full information on all Hobart Kitchen Machines is always available.

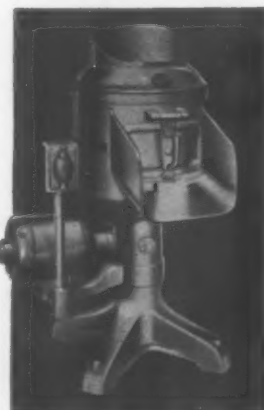
★ ★ ★



**T-215-GAP FOOD CUTTER**  
Floor Type 15-Inch Bowl



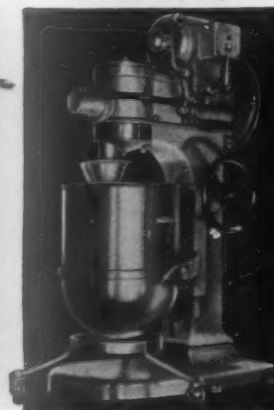
**A-200 MIXER**  
Bench Type  
20-12 Qt. Capacity



**6025 PEELER**  
Floor Type—25 lb. Capacity

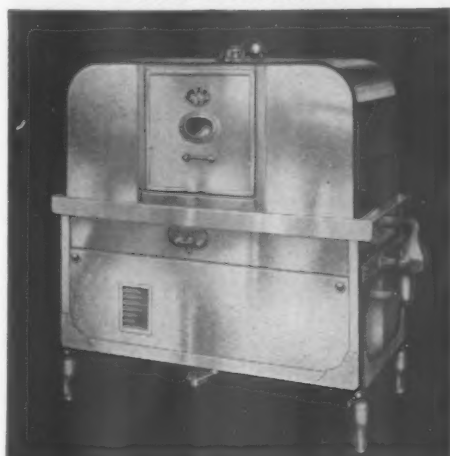


**5-601**  
Floor Type—60 Qt. Capacity

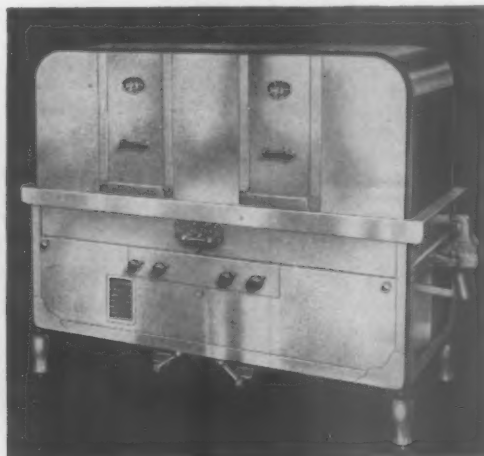


**M-80**  
Floor Type—80 Qt. Capacity

**Model CM DISHWASHER**



**Model GM DISHWASHER**



**Model AM-4 DISHWASHER**



**WORLD'S LARGEST MANUFACTURERS OF DISHWASHERS, MIXERS, PEELERS, FOOD CUTTERS, SLICERS, CHOPPERS, COFFEE MILLS, SCALES**

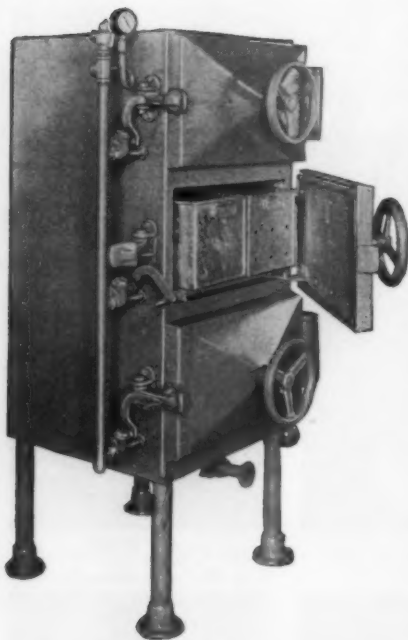
**THE AMERICAN SCHOOL AND UNIVERSITY—1944**





# MARKET FORGE COMPANY

Everett Station  
Boston 49, Mass.



Direct-Connected Thermostatically  
Controlled Steamer — Model 3M

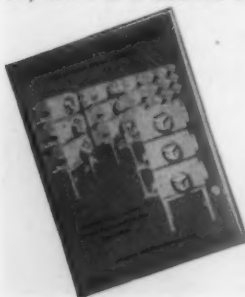
Although proper preparation of food has taken tremendous strides during the last few years, the great majority of people do not yet realize the importance of steam cooking in preserving vital food values. Calcium, magnesium, phosphorus and iron, Vitamins B and C—all are soluble in water and are therefore readily lost by boiling. Live steam keeps the natural juices sealed within the food. Accepted research has shown that losses through steaming are only one-third of those incurred by boiling.

Flavor also is lost when soluble materials have been cooked or boiled out of foods. Steam cooking retains the natural, characteristic flavors of foods, as well as their proper texture and color.

Economy: Steam cooking is less expensive than previously used methods:—Less fuel is used. Food shrinkage is almost entirely eliminated. Kitchen space is conserved (one three-compartment steamer doing the work of a six-foot range in one-third the space); and, most important of all, there is a definite saving of operating labor.

No attention is required during the steam cooking—no danger of boiling over, etc.—It is only necessary to time the brief cooking periods, and these cooking periods are almost unbelievably brief!

Send for free Brochure  
"Compartment Steamers  
for Modern Steam Cook-  
ing"



GREATER EFFICIENCY, FULL DIETETIC CONTROL,  
SENSIBLE ECONOMY, APPETIZING FOODS,  
*for Your School Restaurant,*  
with **MAFORCO**  
**COMPARTMENT STEAMER**

The MAFORCO modern line of Low-Pressure Steamers is now to be found in school and college buildings, hospitals and other institutions in all parts of the country because of its proved efficiency, economy, speed, ease of handling, safety, and the first-rate, attractive, flavorful, nutritive food which each steamer dependably turns out. Vegetables, meats, fowl, sea foods, fruits, puddings all are quickly and appetizingly cooked in a MAFORCO compartment steamer. The use of separated compartments completely eliminates the intermingling of odors.

Operators find the MAFORCO compartment steam cooker also easy to clean, and economical in both floor space and steam consumption.

Only the best of rust- and corrosion-resisting materials are used in building the MAFORCO Steamer.

Special features are the ingeniously designed full floating door and the automatic sliding shelves, which pull out automatically when the doors are opened, making the hot steaming baskets conveniently accessible. An important safety feature—steam is automatically cut off before door can be opened.

The DIRECT-CONNECTED STEAMER is furnished either as a standard thermostatically controlled model which cooks at a steady, even temperature and conserves steam; or as a free-venting model with or without a condenser to carry the steam away.

The STEAM-GENERATING STEAMER operates on gas, steam, or electricity in establishments not provided with steam for direct-steam cooking.

FOR COMPLETE DETAILS ON BOTH THESE TYPES, SEE THE BOOKLET "COMPARTMENT STEAMERS FOR MODERN STEAM COOKING," SENT FREE ON REQUEST

## An interesting list of MAFORCO installations

Yale University,  
New Haven, Conn.  
Cornell University,  
Ithaca, N. Y.  
Harvard University,  
Cambridge, Mass.  
Navy Yard Bldg. 18,  
Portsmouth, N. H.  
Boston Navy Yard,  
Charlestown, Mass.  
Naval Base,  
Coco Solo, Canal Zone  
S. S. Queen Mary  
Fort Shafter, Hawaii  
Northfield Seminary,  
E. Northfield, Mass.  
Mystic Oral School,  
Mystic, Conn.  
Classical High School,  
Springfield, Mass.  
Edgewood Arsenal,  
Edgewood, Md.  
Borinquen Field,  
Puerto Rico



Gas-Operated Steamer — Automatically  
Controlled — Model 2M

THE AMERICAN SCHOOL AND UNIVERSITY—1944

# MORANDI-PROCTOR CO., INC.

Everett Station

Boston 49, Mass.

## LIFETIME KITCHEN EQUIPMENT TO INCREASE THE EFFICIENCY of Your SCHOOL RESTAURANT

Complete kitchen and cafeteria installations, including ranges, sinks, traffic rails, tray trucks, cafeteria counters, steam tables, cooks' tables, urns—every type and size of modern outfittings for cleanly, efficient food preparation and service, have long been specialties of Morandi-Proctor Co. Used by outstanding institutions, universities, schools, hospitals, this equipment is master-designed and fabricated, and will give a lifetime of trouble-free service in busy school kitchens and restaurants. You are invited to consult with our engineers to aid in quickly solving any problems relating to food service.



General Purpose Sinks



Mess-Hall Tray Truck



Sink-and-Cabinet Unit



Illustration of Complete Food Service Equipment Installation  
by Morandi-Proctor Co., Inc.

Illustrated on this page are two recent installations, representing the type of engineering and design service for which Morandi-Proctor Co. has long been known; and two types of sinks which indicate a branch of specialized manufacture based on years of experience and leadership. Morandi-Proctor Co. equipment is truly economical, because it gives a lifetime of service, due to the dependable, tested materials, sound design and master workmanship. Morandi-Proctor installations number the leading hotels, schools and institutions of America.

Write to our engineering department  
for consultation on your specific needs

THE AMERICAN SCHOOL AND UNIVERSITY—1944

# SOUTHERN EQUIPMENT CO.

5017 South 38th Street

St. Louis, Mo.

## SOUTHERN *Food Serving Equipment* "Custom-Bilt" to Your Individual Needs



Double Service Cafeteria Counter, Lincoln High School, Lincoln, Nebraska

### MANUFACTURERS OF:

Electromatic Food-heat  
Tables  
Electromatic Counter  
Models  
Dish, Scullery and  
Kitchen Sinks  
Refrigerated Work Tables  
Bakers' Work Tables  
Vegetable Bin Tables  
Cafeteria Counters  
Lunch Counters  
Short Order Stations  
Sauce Pan Racks  
Silverware Boxes  
Canopies  
Bain Maries  
Steam Jacketed Kettles  
Steam Tables  
Food Pan Containers  
Refrigerators  
Coffee Urns  
Urn Stands  
Urn Trays  
Work Tables  
Display Stands  
Plate Warmers  
Guard Rails  
Back Bars  
Cereal Cookers  
Floor Coolers  
Water Coolers  
Food Conveyors  
Tray Conveyors  
Dish Tables  
Dish Trucks  
Dish Boxes  
Cold Pans  
Pastry Cases  
Butter Chips, Etc.  
Seco Glass Sterilizers

### 100 Typical "Custom-Built By Southern" Installations

#### Partial List of School Installations

St. Bernard's College...Cullman, Alabama	Stephens College (Girls Dormitory).....Columbia, Missouri	Kewark Valley School...Newark Valley, N. Y.	Austin High School.....Austin, Texas
Tuskegee Institute...Tuskegee Institute, Ala.	Lincoln Univ. (Colored)...Jefferson City, Mo.	Grover Cleveland High School.....New York, N. Y.	Wynn Seale Jr. High School.....Corpus Christi, Texas
University of Arkansas...Fayetteville, Ark.	Maplewood Senior High School.....Maplewood, Missouri	Walton High School.....New York, N. Y.	Highland Park School.....Dallas, Texas
Arkansas State College...Jonesboro, Arkansas	Normandy High School...Normandy, Missouri	Edison Elementary School...Carlsbad, N. Mex.	Lily B. Clayton School...Fort Worth, Texas
Palaski Heights High School.....Little Rock, Ark.	Southwest High School...St. Louis, Missouri	Bexley Senior High School...Bexley, Ohio	North Hi-Mount School...Fort Worth, Texas
Western State College...Gunnison, Colorado	Douglas School (Colored).....St. Louis, Missouri	DeVillhiss High School.....Toledo, Ohio	Sam Houston State Teachers College...Huntsville, Texas
St. Patrick's School...Miami Beach, Florida	University of Missouri (Dormitory).....Columbia, Missouri	J. D. Robinson Jr. High School...Toledo, Ohio	A. & I. College.....Kingsville, Texas
University of Georgia (Naval Preflight School).....Athens, Georgia	St. Louis University...St. Louis, Missouri	Ohio State University.....Columbus, Ohio	Laredo High School.....Laredo, Texas
Bloomington High School...Bloomington, Ill.	Missouri School for Deaf...Fulton, Missouri	Ohio University.....Athens, Ohio	Thomas Jefferson Sr. High School...San Antonio, Texas
The Principia.....Elsah, Illinois	Central High School...Jackson, Mississippi	University of Akron.....Akron, Ohio	S. W. Texas State Teachers College...San Marcos, Texas
Scott Hall Dormitory.....Evanston, Ill.	Yazoo City High School.....Yazoo City, Mississippi	Central High School...Oklahoma City, Okla.	Hardin Jr. College...Wichita Falls, Texas
Springfield High School...Springfield, Ill.	Mississippi State College for Women...Columbus, Mississippi	Muskogee Schools (2).....Muskogee, Okla.	Galveston Jr. High School...Galveston, Texas
Notre Dame Academy.....Bellefonte, Pa.	Vicksburg School...Vicksburg, Mississippi	Dawson School.....Tulsa, Okla.	Tyler High School.....Tyler, Texas
Iowa State College.....Ames, Iowa	Wellesley College (Infirmary).....Wellesley, Mass.	Cameron Agricultural School...Lawton, Okla.	University of Texas (Men's Dormitory).....Austin, Texas
Univ. of Iowa (Carrier Hall).....Iowa City, Ia.	Frostburg High School...Frostburg, Maryland	Bartlesville School.....Bartlesville, Okla.	A. & M. College...College Station, Texas
St. Mary's Academy...Leavenworth, Kansas	Allegheny High School...Cumberland, Maryland	Polk State School.....Polk, Pennsylvania	Ogden High School.....Ogden, Utah
Alexander Hamilton Intermediate School...Wichita, Kansas	Montana State College...Bozeman, Montana	Mechanic Arts School...Evansville, Indiana	Jordan High School...Sandy, Utah
Charles Robinson Intermediate School...Wichita, Kansas	New Senior High School...Billings, Montana	Perdue University (Men's Dormitory).....Lafayette, Indiana	Brigham Young Univ...Salt Lake City, Utah
University of Kentucky-Student Union Bldg...Lexington, Kentucky	Dominican High School...Detroit, Michigan	Women's Dorm...Lafayette, Indiana	Virginia Polytechnic Inst...Blacksburg, Va.
Dillard University...New Orleans, Louisiana	Girls Academy (Shrine of Little Flower).....Detroit, Michigan	State Teachers College (Men's Dormitory).....Cape Girardeau, Mo.	Phoenix School, Hampton Inst. (Colored).....Hampton, Virginia
New Iberia Parish High School...New Iberia, Louisiana	University of Minnesota...Minneapolis, Minn.	Samner High School...Kansas City, Mo.	St. Vincent's Parochial School...Newport News, Va.
Louisiana State Normal School...Natchitoches, Louisiana	Lincoln High School...Lincoln, Nebraska	Colorado College of Agr. & Mech. Arts...Ft. Collins, Colorado	Richmond Public Schools...Richmond, Va.
Warren Easton High School...New Orleans, La.	University of Nebraska (Girls Dormitory).....Lincoln, Nebraska	Tennessee State Teachers College, East...Johnson City, Tenn.	University of Wyoming-Student Union Bldg...Laramie, Wyoming
Clayton High School...Clayton, Missouri	North Platte High School...North Platte, Nebr.	Tennessee Polytechnic Inst...Cookeville, Tenn.	University of Wyoming-Women's Dormitory...Laramie, Wyoming
		Central High School...Murfreesboro, Tenn.	
		E. Nashville High School...Nashville, Tenn.	
		Dyersburg School...Dyersburg, Tennessee	
		McKinley High School...Amarillo, Texas	

THE AMERICAN SCHOOL AND UNIVERSITY—1944



# SOUTHERN EQUIPMENT CO.

5017 South 38th Street

St. Louis, Mo.

## *Manufacturers of Food-Serving Equipment for Schools and Institutions*

Six conveniently  
located District

Offices:—

- DENVER
- DALLAS
- MIAMI
- BOSTON
- COLUMBUS
- MOBILE



Service Section View—Texas A. & M. College

YOUR particular problem, whether it is a replacement item, alteration or complete new installation of food serving equipment, requires consideration in selecting a firm most capable of furnishing you this service. Our engineering and designing department with experienced kitchen engineers are available for assistance, consultation and cooperation in the preparation, planning specifications and estimates on any and all of your food serving equipment.

THE AMERICAN SCHOOL AND UNIVERSITY—1944

Located throughout the United States are registered dealers and distributors who carry a stock of our standard items of equipment. Combining this service with our manufacturing plants equipped with modern labor saving machines for fabricating all type of metals used in present food serving equipment construction assures you that our organization can serve you at a minimum cost and with complete satisfaction.

# STANDARD GAS EQUIPMENT CORPORATION

Bayard and Hamburg Streets, Baltimore 30, Md.

BRANCH OFFICES: New York • Boston • Aurora, Ill. • Chicago • New Orleans • Los Angeles

## VULCAN COOKING EQUIPMENT



**VULCAN RANGES** in standardized models serve every cooking need. Extra top capacity at low cost provided by . . .



**VULCAN EXPANDO UNITS** which can be connected to the right or left with top matching range unit



**VULCAN DEEP FAT FRYERS** in various sizes and capacities for every need

**VULCAN ROASTING OVENS** in single units or in battery



**VULCAN CERAMIC BROILERS** give extra speed and large capacity

**VULCAN SECTIONAL OVEN** for all baking, roasting needs



**I**N ADDITION to flexibility and fine cooking qualities, Vulcan Gas Cooking Equipment has a number of economy features which have made important food and fuel savings in many schools. For example, Vulcan Range ovens, roasting ovens and baking ovens are insulated and equipped with automatic heat regulators. The cooks have complete control over oven temperatures. Meat shrinkage is reduced to a minimum. Food savings added to fuel savings have many times paid for the cost of new Vulcan Equipment. Here are some of the operating economies offered:

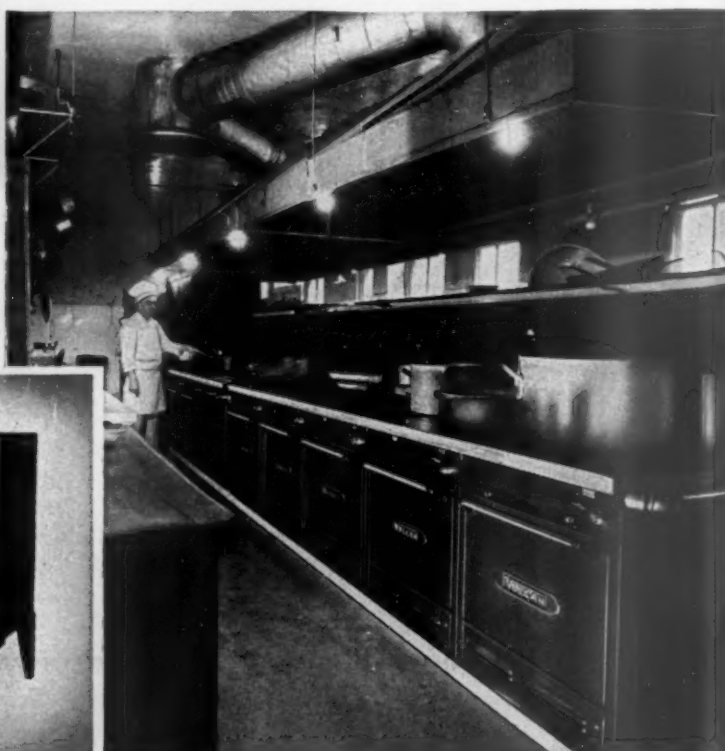
**RANGES:**—Radial fin cook-top construction saves up to 20% fuel consumption. New double deck range oven permits baking and roasting on bottom as well as rack. Gives two-oven capacity in single range space.

**FRYERS:**—Automatic heat control and new type shallow kettles save 20% to 50% in frying compounds while producing properly cooked digestible fried foods.

**VULCAN EQUIPMENT IS AVAILABLE UNDER WPB REGULATIONS. WRITE TODAY FOR CATALOG AND FULL INFORMATION ABOUT VULCAN PLANNING AND RE-MODELING SERVICE.**

**BROILERS:**—Extra large finishing or au gratin oven for starting or finishing operation. Combine even distribution with the superior qualities of gas heat, ceramic radiation and charcoal coloring.

**OVENS:**—Double decker roasting ovens provide large roasting capacity in small floor area by permitting use of wasted wall space.



# NATHAN STRAUS-DUPARQUET, INC.

Sixth Ave., 18th-19th Sts., New York 11, N. Y.

BOSTON . . . . . Jones, McDuffee & Stratton Corporation  
 CHICAGO . . . . . Duparquet, Inc.  
 MIAMI . . . . . Nathan Straus-Duparquet, Inc.



## Let's Put Those IMPROVEMENT PLANS on Paper—NOW



**R**IGHT NOW — while your present equipment is doing a man-size war job— it's time to think of all those improvements you are certain to need when the war ends.

**Put those thoughts down on paper.** This is our urgent message to you at this time. Our staff of food-service equipment engineers and interior furnishings experts will help you, upon request.

By this means, the planning for your various departments . . . improving the kitchen layout or replacing worn-out cooking or serving equipment . . . refurnishing reception rooms or sleeping quarters . . . all modernization plans will be ready by the time the equipment is available.

If both **plans** and **installations** are left until the war ends, the demands upon our expert, highly specialized manpower may cause inevitable delays in fulfilling your needs. So let's start now — **do something about it!**



FURNITURE \* CARPETS \* DRAPERIES \* LINENS \* CHINA  
 GLASS \* SILVERWARE \* KITCHEN EQUIPMENT and UTENSILS  
 REFRIGERATORS and REFRIGERATION



# THE JOHN VAN RANGE CO.

525-555 Culvert Street, Cincinnati, Ohio

**TODAY—STRATEGICAL PLANNING**

**TOMORROW—TACTICAL VICTORY**



**F**ROM Casablanca to continental Europe, every detail of the tactics of American warfare has followed the blue print of grand strategy **planned in advance**. Victories have been won on sea and land and in the air by men completely equipped with modern weapons, modern transport and modern equipment for preparing and serving food.

Much of the food service equipment was planned, designed and manufactured by The John Van Range Company. It, too, was prepared **in advance**. Into its production were incorporated improvements as great as those in air craft, guns and armored tanks.

Farsighted school executives are profiting from the experience of our armies, navies and fighters of the air. They are planning today for the buildings of tomorrow. Like the leaders of our armed forces, they are availing themselves of the services of

## JOHN VAN RANGE FOOD SERVICE ENGINEERING

The kitchen equipment of tomorrow will be more rugged and more compact than that of pre-war times. Safety devices and temperature controls will be automatic. Materials will be more durable and very much more attractive in appearance. Sanitation will be simplified by refinements of assembly and the absence of dirt-retaining angles. Costs of fuel and maintenance will be reduced. Cooking will preserve the natural juices, flavors and nutrients of provisions.

In anticipation of the demands of the post-war period, let us plan your new layouts now. Use your priorities for temporary replacements.

# *The John Van Range Co.*

**EQUIPMENT FOR THE PREPARATION AND SERVING OF FOOD**

CINCINNATI, OHIO

BRANCHES IN PRINCIPAL CITIES

# JOHN E. SMITH'S SONS CO.

50 Broadway, Buffalo 3, New York  
SALES AND SERVICE OFFICES IN PRINCIPAL CITIES

**SAVE TIME  
AVOID WASTE and REDUCE  
EXPENSE**

**in your Kitchen with**

## Buffalo KITCHEN MACHINES

Mechanical units in school and university kitchens must be economical in both initial and maintenance costs and should render many years of efficient service. They must save time, reduce food waste, meet stringent sanitary requirements and prove a definite help in the preparation of healthful and attractive menus.

The Buffalo products shown here are designed to meet...and have met...every condition of economy and utility required by the most rigid school and university specifications.

There are other Buffalo labor-saving machines that meet many modern kitchen needs. They are described in our Catalog. Write for a free copy today.

### Attachments for BUFFALO Vegetable Slicers and BUFFALO Food Cutters

Grater—grating cheese, bread crumbs, nuts.  
Shredder  $\frac{3}{8}$ " holes—shreds vegetables, etc.  
French Fry Cutter.  
Julienne Potato Cutter.  
Adjustable Slicer—vegetables, nuts, fruits.  
Shredder  $\frac{3}{16}$ " holes.  
Vegetable Slicer housing furnished as standard equipment including adjustable slicer No. 4.  
Meat Chopper No. 12, 200 lb. per hour; No. 22, 400 lb. per hour.  
Vegetable Slicer door for slicing vegetables at right angles to knife.  
Hub Adaptor—required to connect attachments to Food Cutter.  
Knife and Tool Grinder.  
Orange Juice Extractor.



### BUFFALO Self-Emptying Meat and Vegetable Cutter Model 120

OTHER MODELS		
NO.	BOWL SIZE	CAPACITY
321	21 in.	20-25 lbs.
217-D	17 in.**	15 lbs.
111-D*	15 in.**	10-12 lbs.
114*	14 in.**	7 lbs.

\*Also made in bench type without pedestal. \*\*Bowl is removable.

The machine of 100 uses in the kitchen. The only self-emptying model made. For fine chopping of all kinds of meats and vegetables. Its 20" non-removable bowl holds 20 lbs. of fresh meat. Eliminates hands contacting foods. Safe and sanitary.



### BUFFALO Bread Slicer (Model 1-A)

OTHER MODELS	
NO.	MAXIMUM LOAF SIZE
1A	5" x 5" x 23"
2-A	7" square x 26" long

All models either power or hand driven.

Saves time by eliminating hand-slicing. Cuts more slices per loaf, all uniform. Saves from 4 to 6 slices per loaf. Automatically fed, sliced and stacked. Thickness of slice adjustable from  $\frac{1}{8}$ " to  $\frac{3}{8}$ ". Model 1-A maximum loaf size 4 $\frac{1}{4}$ " x 5 $\frac{1}{4}$ " x 22".



**QUALITY  
KITCHEN MACHINES**

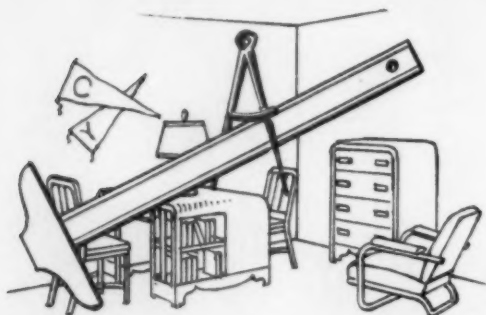
# Buffalo

# DOEHLER METAL FURNITURE CO., INC.

Executive Offices: 192 Lexington Avenue, New York 16, N. Y.

For Dormitory — Cafeteria — Reception Room — Infirmary

## FOR A BETTER SCHOOL TOMORROW



## PLAN NOW

to install

## DOEHLER

## METAL FURNITURE

**I**F your furniture has taken "a wartime beating," if priorities have prevented normal replacement, *plan now* to furnish your dormitories and study rooms with the furniture the years have proved best for institutional purposes—DOEHLER METAL FURNITURE...

1. Costs less than corresponding wood furniture—upkeep expense is practically nil.
2. Outlives wood furniture by years—looks new longer, is usable longer.
3. Reduces fire hazards; frequently fire insurance rates, too.
4. Minimizes noise—cannot warp; hence, doors and drawers cannot stick or screech.
5. Quickly, easily cleaned; stains, "rings," dirt—all wipe off with a swish of a cloth.
6. Resistant to cigarette burns, percussion, weather—won't chip, blister, or crack.
7. Homelike and comfortable—attractive styles, cheerful colors, wood-grain finishes.

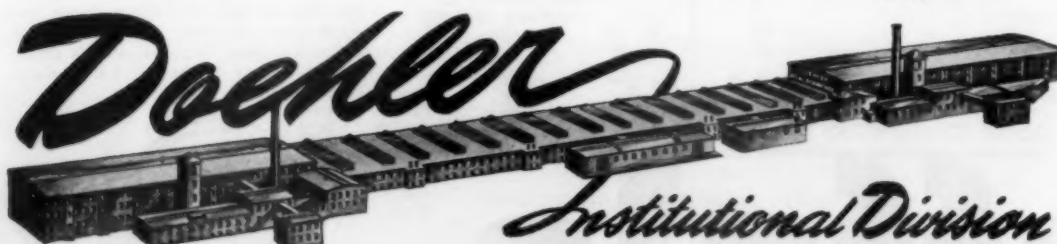
At present, DOEHLER METAL FURNITURE is not obtainable. Doehler's plant facilities are currently producing "fighting items"... machine-gun mounts, turret-tops for tanks, "stick controls" for planes, metal furniture for Army, Navy and maritime needs.

These wartime assignments have taught us to fabricate non-ferrous metals and plastics; have trained our personnel to produce with greater precision; have stimulated the development of *even better* DOEHLER METAL FURNITURE when peacetime production is resumed.

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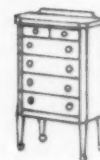
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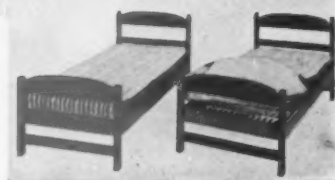
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## MAINTENANCE AND OPERATION OF THE SCHOOL PLANT

*The efficiency, as well as the life of the school plant is directly affected by the quality of performance exercised in its maintenance and operation. Probably no phase of administration has been more neglected. This edition of the AMERICAN SCHOOL AND UNIVERSITY presents a number of timely articles on problems in this area. It is hoped that they will stimulate more thought and action with respect to keeping our school plants operating at 100 per cent efficiency.*

# PLANNING SCHOOL GROUNDS—THE UTILITARIAN AND THE AESTHETIC

By H. O. WHITTEMORE

Department of Landscape Architecture, College of Architecture and Design, University of Michigan, Ann Arbor

**S**CHOOLS are for children, wherein they learn and practice intelligent living. The modern teacher will agree to that, I am sure. The modern teacher does not want great elaboration, does not ask that a school building be a great renaissance or gothic palace or the grounds a second Versailles, to which the citizens can point with pride and then worry about the upkeep and the unused space indoors and out, which contribute to the monumental effect only.

As the modern school is a place in which to live and learn, and to learn how to live, one would not turn the whole school grounds into an ornamental garden, nor would he allocate the whole area to rough and tumble play. Just as in the building where one provides space to travel (the halls), to study (libraries, study halls and classrooms), to work (the laboratories and shops), to eat (the cafeterias), for administration (the offices), for personal service (bathrooms, toilets, medical clinics), for general service (boiler room, storage, machine room), for play (gymnasiums), just so one must study the desirable outdoor activities and allocate necessary space of the proper form, and then relate these spaces conveniently to each other and to the building, and to the property provided.

## Usefulness Is Beauty

The utilitarian requirements for school grounds have been the subject of frequent articles in *THE AMERICAN SCHOOL AND UNIVERSITY*\* and other publications. These articles have repeatedly called attention to the desirability of beauty in school buildings and grounds, first to promote the general cultural development of the child, and second, to generate a pride in the school on the part of the child and his community. This is good, but there seems to have been an unfortunate tendency to separate the "aesthetic" from the "practical" and to base each upon a different set of principles. The thought seems to be that the utilitarian should "balance" the practical, that there should be a sacrifice of the one in order to admit the other, so that the result is always a compromise. Even the best books on the subject of aesthetics in landscape design separates the chapters dealing with aesthetics from the ones dealing with utilitarian requirements, placing them at opposite ends of the book. One group of designers and builders, sometimes calling themselves hard-boiled practical men (the engineers) are inclined to say that the opposite group, the artist designers, are impractical and visionary. The artist designers retaliate that the former may be practical, but that otherwise

they are uncultured and uncouth, and know not the higher things of life.

All of this argument is really quite silly. We must ask ourselves these questions: When is a thing really useful and practical? When is it satisfying, enjoyable, or beautiful? The writer ventures the opinion that a thing is really useful when we not only can do what we want to with it, but when the enjoyment in the doing of it and the pleasure of contemplation and pride in our tool or the thing we use make us want to use it again and again. Also that a thing is beautiful when it is aesthetically satisfying not only for its color, form, character, and organization, but also for pleasure or imagined pleasure in its use, occupancy, or possession. In other words, its evident usefulness is part of its beauty. One cannot help but observe that nearly all of the finest and most lasting works of art have for their purpose the serving or portraying of the elemental activities or emotions of men or processes of nature. Beauty in a school building or grounds is not, as we now understand it, a matter of surface decoration with fancy brickwork or colorful shrubbery, but beauty should be "built in" as a perfect coordination between the material and the form of the building and grounds, and its evident use and purpose.

## Modern Planning Is Practical

No longer does the modern landscape architect look up and read that there should be 200 square feet of play space for each child, multiply the figures, and set aside that amount of space on the grounds for play, and then appropriate the rest for lawns, trees and shrubbery for decorative effect. Instead he goes to schools of similar type and watches the children actually at play, in school and in their coming and going. He consults with those that teach and guide them; he learns the mistakes that have been made and then obtains ideas from forward-looking educational authorities as to what school activities will be like in the next ten or twenty years. He notes in the rough and tumble of childhood action where the wear and tear most likely occurs on the grounds and makes provision to meet it with wear-resisting materials. He notes where and how children get hurt and tries to avoid the danger. He notes where trouble occurs from outside bullies or neighborhood gangs and provides means for protection. He even observes how the youngsters get their clothes dirty or their feet muddy, and how on rainy, or cold windy days, the children must gather in the school building before and between school periods—to the trouble and worry of teachers and janitors—and seeks to provide large wind and

\* Editor's note: See "Landscape Design and Construction," Cumulative Index to Editorial Subjects, p. 5 of this issue.





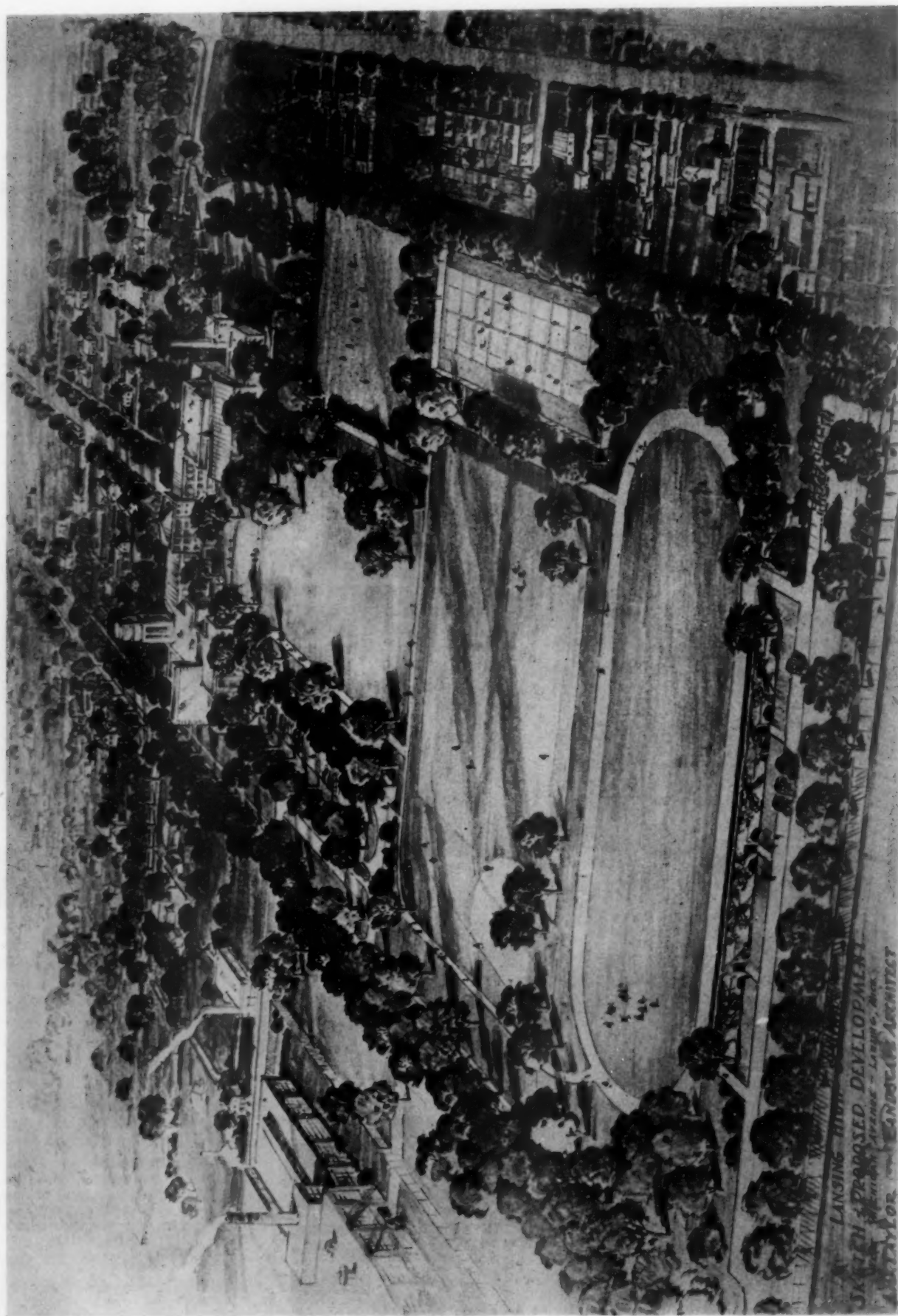
All of the illustrations on this page are of the rural school at Sacacoyuca, a little village in Mexico

Left—The library of the school building opens out into a stage for an outdoor theater. The partly shaded courtyard is the place for the audience

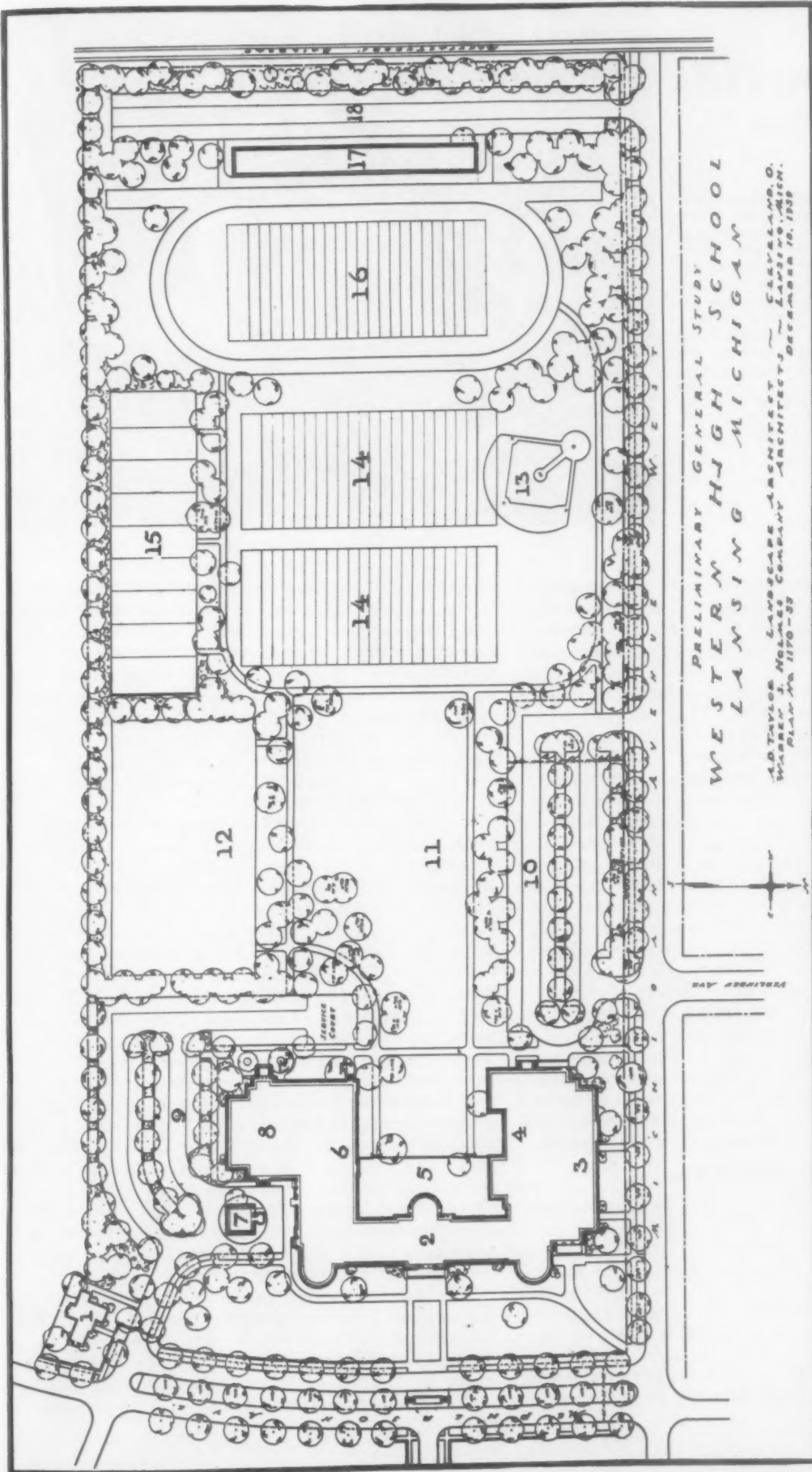
Right—A double house for the two teachers of the school. With the two-story buildings, the designers turned the sloping ground to full advantage, creating a fascinating variety of levels, roof lines and wall planes, lights and shadows, and ground forms



Left—The school workshop and co-operative store building for the community has a stable in the basement and cattle corrals beyond. Serves also for agricultural classes



A perspective view of the Sexton High School in Lansing, Mich. The reader will observe many interesting and efficient features of this modern design. The aesthetic effect of the grounds and building is completely integrated with its use pattern



Western High School (now called Sexton High School), Lansing, Michigan

LEGEND

- |                               |  |   |
|-------------------------------|--|---|
| 1. Home Economics             | 8. Natatorium, Gym., and Locker Room                         | 13. Baseball  |
| 2. Western High School        | 9. Parking Area—135 cars                                     | 14. Athletic Fields                                   |
| 3. Auditorium                 | 10. Parking Area—160 cars                                    | 15. Tennis Courts                                     |
| 4. Wood, Auto, and Metal Shop | 11. Boys' Physical Education Field                           | 16. Exhibition Field and Running Track (Quarter mile) |
| 5. Terrace                    | 12. Girls' Physical Field (Flood for skating rink in winter) | 17. Bleachers   |
| 6. Cafeteria                  |  | 18. Parking Area—140 cars                             |
| 7. Heating Plant              |  |   |



A typical modern school playground, Vancouver, B. C. The location of the school building at one end of the block leaves a complete unit for the children's area which provides for every activity that could be desired except digging trenches or woodland fox and hounds. Heavy shading trees are kept to a minimum as the climate of Vancouver makes full sunlight desirable. The open center, with apparatus outside of the short running track, provides unity and simplicity of organization which is the basis of good aesthetic design as well as of utility



rainproof outdoor shelters for all but the youngest. Along with these shelters will go evergreen wind-breaks and well-drained, paved terraces, or wide entrance walks for the usual milling around before the doors open.

One of the most important matters facing us today is the danger from street traffic. Many worried parents send their children to school by bus or drive them to school even for short distances. This is partly due to the unfortunate location of many of our schools, even elementary schools, where many of the children have to cross one or more heavy traffic thoroughfares. We must recognize that the location of a school is inherently a part of its design. In a nearby city, a group of educators who ought to know better selected a site for a junior high school on the opposite side of a trunkline by-pass highway where high-speed, heavily loaded freight trucks are passing constantly. School grounds should be located and planned with definite relation to the multicellular pattern of the city plan, each elementary and junior high school centrally serving a neighborhood bounded by trunkline highways or major streets or railways. Proper location would allow children to walk to school with but little danger and make it unnecessary for parents to drive their children to the door, creating a congestion at school time and actually increasing the traffic hazard.

#### Examples of Integrated Planning

Herewith are illustrated three examples of school grounds that bear examination with reference to the integration of utility and aesthetics.

The first illustration furnishes one of the finest examples of perfect integration of the school and grounds, the whole, a grouping of buildings and yards into a thing of matchless beauty, is the center of life in the small community. This school is located at Sacacoyuca, a little village on the highway between Mexico City and Acapulco, in Mexico. It is the work

of native villagers under the direction of Carlos Contreras, eminent Mexican architect and town planner, and his associate, Carlos Tarditi, with the blessing of Lazaro Cardenas, at that time president of the Mexican Republic. There is not one bit of space in the buildings or grounds that is not of the highest utility—some are even of double or triple use—not a brick or tile or tree or fence post not functionally necessary. There was not a penny to waste for materials.

The second example is the new Sexton High School at Lansing, Michigan. The whole is so new that we are showing, by preference, the perspective drawings of the landscape architect, A. D. Taylor, of Cleveland. The tract is a large one, well located, and well wooded. In spite of the desirability and beauty of the woods, Mr. Taylor recommended clearing away part of them to provide room for playgrounds and athletic fields. Some may have complained at the loss of this natural beauty, but Mr. Taylor knew that the woods would be used for needed play space anyhow. This would lead to packing and trampling of the soil above the roots, causing the trees to sicken and die sooner or later, the net result being ugliness coupled with a very inefficient and perhaps dangerous play area. A few healthy trees, serving for shade, windbreak, and setting for the building are far better than a grove of sickly ones. If the grounds are large and the grove well located, it should be continued as a picnic grove and nature study area, carefully protected against rough and tumble play. This modern design shows us that in all things well done, the designer or maker must in himself have combined, inseparably, the practical man and the artist.

The third example (see top of page), the perspective of a school grounds planned by Harland Bartholomew and Associates for Vancouver, B. C., shows an elementary school on a four-acre city block where everything is subordinated to maximum use, yet is undeniably attractive.

# FACTORS AFFECTING FLOOR MAINTENANCE

By I. O. FRISWOLD

Director, Division of Buildings and Business Administration,  
Minnesota State Department of Education, St. Paul

A GREAT deal is now known about floor maintenance. Anyone concerned with this field can secure helpful information not only from manufacturers of floor materials, supplies, and equipment, but also from building custodians, business managers, and maintenance experts who have learned through first-hand experience how to cope successfully with floor maintenance problems.\*

Today the need is greater for disseminating information, inculcating skills and appreciations and securing widespread use of proved and effective floor maintenance supplies, equipment, and methods than it is to discover new and better ways to maintain various types of floors that are now commonly installed in public buildings.

Within the compass of this brief discussion, attention will be directed to some of the facts and factors pertaining to floor maintenance with which public school authorities and others concerned with the problems in this field should be acquainted.

## Definition of Terms

For purposes of classifying expenditures, a technical distinction is made in accounting terminology between *operation* and *maintenance* of the physical plant. If accurate and comparable costs of maintaining various types of floors by various methods are to be ascertained, and it is desirable that they should be, a workable clear definition of what is to be included in the term "maintenance of floors" is needed.

Maintenance should be defined to mean replacement and repair. Re-nailing loosened floor boards would be an example of repair; substituting a new for a broken tile in an asphalt floor would be a replacement. The labor and materials required to prepare a new floor for the application of a penetrating seal, and the initial sealing of the floor would be a capital outlay but the reconditioning of a floor by sanding to remove the wax and surface seal and applying a new seal would properly be regarded as a replacement that should be classed as floor maintenance.

It is not possible here to do more than point to the need for defining terms and to present a few illustrations of what should be classed as floor maintenance

and what properly should be classed under *operation* of the physical plant insofar as floor care is concerned. Scrubbing, mopping and sweeping, and in general, keeping floors clean, are not maintenance but are instead properly classed as part of the operation of the physical plant. Operation of the building in general has to do with keeping it clean, heated, ventilated, lighted, and ready for use.

From a practical viewpoint, floor operation and floor maintenance are so closely related at times that it is difficult to distinguish clearly where one begins and the other ends. Likewise, a floor maintenance project at times may involve capital outlays in that it includes additions or improvements that go beyond mere replacement or repair. These facts must be appreciated and taken into consideration if progress is to be made in ascertaining unit costs that are accurate and that can be used in studying comparative costs of floor maintenance.

## Building Operation

To the extent that the operation of a schoolhouse or other building is good, the need for floor maintenance will be reduced. The care that is given school floors, for example, obviously will affect the need for their replacement and repair. Dust and dirt if permitted to remain on a floor, accelerate the destruction of the protective finish, increase the damage to the floor resulting from abrasive action or discolor the floor by being ground into it, thereby requiring more frequent and more drastic reconditioning than otherwise would be needed.

Use alone or depreciation resulting merely with the passage of time are not the only factors that determine the need for floor replacements and repairs. A school custodian who habitually uses too much water in scrubbing and mopping and permits it to stand on a wood floor too long is contributing to the deterioration of the floor.

Recently my attention was called to a new school building of good construction in which a part of the science laboratory floor, consisting of hard maple squares laid in mastic on a concrete slab, were loosened principally because an excessive amount of water was spilled on the floor by pupils and not mopped up. Shortly after this situation first came to my attention, I learned the building was permitted to get so cold that water in the plumbing froze. This led to flooding of the entire floor so that serious damage to it was no longer confined to the limited area first reported.

In another school building with a half story of the

\* Trade and professional magazines and yearbooks such as this contain many valuable articles on floor care. Reference works such as the following are particularly valuable:

Holcombe, Paul E. *A Study of Floors*. Chicago: National Association of Building Owners and Managers. (\$1.00)

Longshore, James H. *Floor Research*. (Revised Edition) Brazil, Indiana, Continental College of Floor Engineering, 1937. (Paper cover, \$3.50; cloth bound, \$5.00)

Plaister, Cornelia D. *Floors and Floor Coverings*. Chicago: American Library Association, 1939. 75 p. (75¢)

Viles, N. E. *The Custodian At Work*. New York: The University Publishing Company, 1941. 391 p. (\$2.50)

basement above grade, even floors on the first floor level at least five feet above grade swelled and buckled so much each summer the bottoms of doors had to be sawed off before they could be opened and closed. Removal of a strip of flooring did not prevent a recurrence of the difficulty, which could have been readily reduced by opening basement windows for ventilation and by the use of calcium chloride to absorb excessive moisture in the basement.

The two illustrations here presented are somewhat extreme but they should leave no doubt that the operation of a building may affect materially the need for floor maintenance.

#### Building Design

The design and choice of materials for a building may also affect the need for floor maintenance. In some instances, conditions may necessitate the redesign and reconstruction of floors if excessive maintenance costs are to be avoided. It may not suffice, for example, merely to replace a wood floor below grade if it has deteriorated to the point where it can no longer be used. Instead it may be necessary to

construct a new sub-floor and also to replace the wood floor with asphalt tile, where unfavorable moisture conditions exist.

The inspection of a newly erected shop unit with a wood block floor laid in mastic on a concrete slab resting on the ground revealed that a large section of the floor had heaved and broken. Insufficient protection of the floor from moisture difficulties not only resulted in additional expense but the appearance of the floor is marred to this day by the damage that was done.

In another school shop with a wood block floor on a concrete slab no difficulty with moisture has been encountered, but the layout of the shop was not planned in advance so no anchors for heavy machinery or for benches were provided in the slab. Sections of blocks have been removed and replaced in providing anchors and the results have not been good. Some equipment was fastened only to the wood blocks which as a consequence have been loosened or split.

In another school building the classroom floors on the second floor level had sunk so much over a period of years that there was an abrupt and very notice-



Dust and dirt if permitted to remain on a floor, accelerate the destruction of the protective finish





able drop as one stepped into a room from the corridor. The floors had dropped an inch and a half or more below the moulding at the base of the mopboard. An examination of the plans of the structure revealed that the sub-floor rested on 2" x 14" joists and that between the sub-floor and finish floor a layer of blanket type insulation and  $\frac{3}{4}$ " nailing strips had been installed. The natural shrinkage of the wood joists and nailing strips and the compression of the layer of insulation resulted in an unsatisfactory floor condition that could be remedied only by rebuilding the entire floor of each classroom.

The difficulties encountered with gymnasium and other large floor areas because adequate provision has not been made for circulating air in the space between sleepers and in specifying a moisture repellent treatment for sleepers are too well known to need illustration and elaboration.

Limitations of space again prevent the presentation here of an extended list of illustrations of the fact that the design of floors has a great deal to do with the problems of floor maintenance that arise. Likewise the choice of floor materials for various uses and conditions of installation must be given careful consideration before buildings are erected if floor maintenance problems are to be reduced to a minimum. Of the qualities sought in flooring materials, resistance to abrasive action, alkalies, acid, grease, indentation and moisture damage, and the probable need for and ease of repairing and replacing them should be given careful consideration.

#### Grounds and Building Features

The character of the school grounds and features of the building itself that may affect appreciably the problems of floor maintenance in the structure should also be given consideration. For example, a sandy playground from which children track in excessive amounts of sand will wear away the floor surfaces rapidly if effective action is not taken to prevent it.

Factors outside of the building, such as the surfacing of playgrounds, the presence or elimination of mud puddles and bare areas, and provisions made for good walks in the grounds and surfaced streets in the vicinity of a building have a bearing on the time and thought that must be given to floor care to secure satisfactory results.

Unless a building is provided with mats, scrapers and other means to enable pupils to clean their shoes before or as they enter the structure, the problem of

floor care and preservation will be accentuated. Likewise, the movable equipment that is housed in a building and the way it is designed and handled may affect floor maintenance to an appreciable degree. Furniture standing on an asphalt tile floor, for example, should be equipped with flat base gliders that will protect the surface from indentation. The practices employed in moving objects, such as a piano or office desks or folding chairs on trucks, may have much to do with the damage that may be done to floors.

#### Personal Factors

Contractors are known to cut corners, and workmen are not always as conscientious as they could be. Consequently, all too often in tearing up an old wood floor to re-lay it to remove the noise it makes when walked upon because the finish floor and rough floor have separated, we find that sufficient nails were never used to fasten the finish floor down securely. Lack of good workmanship and adequate supervision created a floor maintenance problem that could possibly have been prevented.

Great differences are to be found in the condition of floors in different buildings essentially similar in age, utilization, and construction. Such differences are due to the differences that are found in the attitudes and competence and actions of the personnel responsible for the upkeep and care of the respective buildings.

#### Conclusions

1. Although a great deal of information about floor maintenance is available, it should be distributed more widely and applied more effectively in field situations.

2. A clear understanding of what is meant by the maintenance of floors is needed so that the term will not be used as loosely as it is in current literature dealing with floor care and upkeep.

3. In order to reduce floor maintenance costs to a minimum, it is necessary to recognize the fact that maintenance begins before a building is constructed. Factors such as the type of housekeeping and janitorial-engineering service that is provided, the design of a building and the materials that are specified, the physical features of the grounds and the equipment provided in the structure, and the interest and competence of those responsible for physical plant provisions all play an important part in determining the extent and the nature of the maintenance that is necessary to keep all types of floors in good repair.

# FIFTY YEARS IN HEATING AND VENTILATING \*

By SAMUEL R. LEWIS

Consulting Engineer, Chicago, Ill.

**B**ASED on my memory and on considerable reference to old text books and catalogs I found that eastern and central western practices in heating and ventilating 50 years ago had many differences in 1894.

## Sectional Differences

The central west seems to have preferred single-pipe steam heating, while the east used two-pipe systems; usually with the return mains sealed below the water level in the boiler. Chicago had miles of apartment buildings all with single-pipe steam heating systems; most of them with brick set steel fire-box boilers.

New York had many similar buildings, but the radiators usually had two connections and two valves, and the boilers were likely to be of sectional cast-iron type. Perhaps the early two-pipe vapor systems were developed because of the difficulties in controlling steam radiators which had two valves.

## No Space for Burning Coal

The design of cast-iron sectional boilers as of 1894 shows that heat transfer surface was sought at the expense of adequate combustion chamber height. They made the boiler so full of water passages that there was not enough space left for the burning coal.

I remember being called on to correct the heating of a large Chicago residence about 1910. The sectional boiler had water-cooled heat absorbing surfaces only 14 in. above the top of the 60-in. long grate. They could not burn enough coal to heat the house. I held the boiler up on jackscrews while I wrecked the cast-iron base and lowered the grates to give a 30-in. clearance between them and the top of the combustion chamber. Refractory lined masonry was used to form a new firebox and ashpit. The results were excellent in every way, and the old boiler serves the old house with ease and satisfaction to this day.

I remember designing the heating of two large high schools within 50 miles of New York City, about 35 years ago. The contractors seemed to know nothing about steel firebox type heating boilers such as I was accustomed to use in the west. I also remember seeing in the public schools in Elmira, New York, sectional cast-iron boilers operating at 50 lb. per sq. in. pressure and furnishing steam to run the fan engines.

One large manufacturer made a very radical change in the design of cast-iron sectional boilers about 1905, cutting out most of the interior water passages and

gaining combustion space at the expense of heat absorbing surface. These boilers had hot breechings and the design very quickly was modified to one in which there was a more logical balance between the two fundamental requirements.

All of the early sectional cast-iron boilers were short on steam liberating area at the water line and on interior water circulation from section to section. It is only within very recent years that the large top connecting nipple, partly below the water line was developed. With the older boilers priming usually manifested itself and much washing out of every new boiler was required. The increased steam liberating area and the coherent water circulation when the top nipples are partly below the water line have improved this matter.

Old catalogs show cast-iron sectional boilers encased in brick-work, and many round boilers equipped with steel jackets. Then steel jackets on cast-iron boilers seem to have been forgotten during many years, only to reappear in comparatively recent times with de luxe baked enamel finish.

## Vacuum System of Heating

Around the first of the century there was some question in designers' minds as to justification for use of the comparatively new vacuum system of steam heating, on which a royalty must be paid on account of patents. The Paul scheme, started in Chicago, I think, involved piping up the air vents of a single-pipe radiator system, leading to a steam jet exhauster in the boiler room for maintaining subatmospheric pressure when desired throughout the system. It improved many an otherwise sluggish and noisy steam heating plant and hundreds of the old systems still are in use, usually with improved exhausters.

Some one then developed a trap for the return connection from each radiator on a two-pipe heating system so that the Paul separate air pipe would not be needed. This trap at first was of float type and its use was popularly believed to require that a royalty must be paid to the owner of the Paul patent. In those days there was much litigation concerning patents on subatmospheric steam heating.

The float trap had definite limitations and soon was succeeded by the vapor filled thermostatic disk and bellows type of vacuum trap which persists to this day.

## Formula for Radiation

I have a data book which was published in 1895. It carries advertisements of the principal manufacturers of heating and ventilating equipment. It gives

\* Presented at the Annual Meeting of the American Society of Heating and Ventilating Engineers, New York, N. Y., January 1944; reprinted from ASHVE Journal Section, Heating, Piping & Air Conditioning, January 1944.

the amount of direct radiation alleged to be necessary at various rates per square foot of glass surface, or per square foot of wall surface or per cubic foot of contents of a room. It is careful not to suggest the most approved rate, but one example cites 1 sq. ft. of radiation for 37.5 cu. ft. contents.

I know that in those days no one did much Btu work, but generally used the formula ascribed to Mills for steam, which was:

1 sq. ft. of radiation for each 2 sq. ft. of glass in outside walls, plus 1 sq. ft. of radiation for each 20 sq. ft. of exposed wall (deducting the square feet of glass) plus 1 sq. ft. of radiation for each 200 cu. ft. in the room.

For ordinary thermally circulated hot water radiation the factors changed to 2, 10 and 60 respectively. Like many old housewife medicines, this rule of thumb checks very well with the average of more scientific formulas.

#### Radiators of the Mauve Decade

Some of the Bundy radiators of 1894 were arranged for cast-iron or marble flat top plates. These radiators were made of cored cast-iron tubes screwed into cast-iron bases. They are rarely seen these days. All sectional radiators definitely had to be ordered as for steam, with bottom connecting nipples only, or for water, with both top and bottom nipples. It was believed then that a water radiator would not work if used with steam; the contrary fact not having been discovered until passage of many years after 1894.

A good deal of emphasis seems to have been given to flue type radiators, some having vertical solid flanges, while others had curved flanges intended to encourage reception of air by the radiator in a vertical up-going stream with delivery from the face of the radiator in a horizontal direction.

One rarely sees a dining room radiator having shelves for warming the dinner plates and coffee cups behind cast-iron doors, although they were popular in the nineties.

#### A Thing of Beauty?

There were long arguments about how to measure the radiating surface of an ornamental cast-iron radiator and rival manufacturers questioned the methods of measurement by their competitors. As far as I can learn it was not until well along in the present century that the obvious fact occurred to any one that each 144 sq. in. of surface in a radiator gives off heat at widely varying rates depending on a great many factors. End sections being exposed to free air circulation condense more steam than interior sections. The upper areas of tall radiators never see any air but that which already has been warmed by surfaces lower down. Wide radiators heat much less air per unit of surface than do narrow ones. Steam in one large tube heats less air than when in several small tubes in the same space.

The radiator manufacturers of 50 years ago seem to have been in some agreement that a radiator might be a beautiful thing if sufficiently ornamental. One can be thankful that we have emerged from that Victorian era to the present plain, thin tube, low height type of radiator.

#### Trouble Ahead with Present Day Convectors

I cannot feel that with the present enclosed, thermally circulated convector we are making progress. For efficiency in transferring dust from the floor to the wall, and for effective laying down on the job when the heating medium within it is only warm and not hot, the finned tube convector of around 1940 is unsurpassed. I vote to consign it to the limbo of forgotten things along with such names as I can cull from the old catalog as follows:

Volunteer, All Right, Commonwealth, Hecla, Mascot, OK, Hub, Economy, Novelty, Sunray, Cataract, Faultless, Royal, Electric, Tropic, Perfect, Modern, Florida, Advance, Little Giant, Imperial, Champion, Joy, Crescent, Climax, Elite, Cyclonic.

Steam convectors in 1894, where used with mechanically circulated air, almost universally were made of 1-in. pipe screwed into cast-iron headers or bases. There was talk about that time of a new cored cast-iron prime surface convector which was to be called Vento.

All of the original convectors were difficult to vent, especially when applied to vacuum systems. Frequently the older cast-iron extended surface convectors which had been used for years with thermally circulating air, were installed in fan systems. These are no longer made except under protest. They had round pins and thin flanges and carried such names as Perfection and Excelsior and Gold.

The pipe coil fan system convectors were built in many types. One had pairs of pipe from a double chambered horizontal box base connected at the top with return bends. Another used two cast-iron headers, one as a base, for condensate and one at one side, vertically disposed, as steam supply. The Chicago schools used a special base for many years in which the steam supply came vertically through the bottom of the single chambered base casting.

Any old time steam fitter will remember the fun he had when converting some of these old pipe coil convectors originally installed for pressure service, to drain and to vent under more modern vacuum system conditions.

When Vento blast radiation came along early in the century, some research and experimenting on the jobs, in which I had no small part, had to be encountered before the correct air venting technique was developed. Cast-iron convectors, such as Vento, do not freeze so quickly as do the more flashy thin tube, wide flanged, present day convectors, but the great weight of cast-iron gradually may cause its retirement. One may predict much future trouble with the present day convectors, made of thin steel substituted by emergency for the everlasting copper of prewar days.

#### Radial and Axial Flow Fans

Fans in 1894 were of the eight-blade, centrifugal or radial flow type, with straight blades. In selecting one of these devices from the manufacturer's rating, there was always a discount for optimism of from 40 to 60 per cent. The modern, narrow multiblade fan wheel had not been imported (I think it came from Ireland).

There had been little research on fan efficiencies and all radial flow fans had small outlets and chaotic



delivery velocities at various spots across these outlets. If perchance a fan after installation, proved too small, additional steel plates could be bolted to the outer edges of the paddles, thus increasing the diameter and the noise and the power. Not much was said in catalogs about the volume and power at various resistances.

There were axial flow fans of flat disk type and of propeller type, but it was known that they were not of much use in heating systems because of failure to overcome the resistance due to heaters and long ducts.

There was little knowledge yet developed concerning refinement of centrifugal fan inlet rings, various curves in blades, etc. Research along these lines still continues, and if one can believe the advertisements there will emerge for general use, after the war, great improvement in axial-flow pressure type fans.

#### Warm Air Heating

Warm air heating by direct coal-fired cast-iron furnaces was well developed in 1894, especially for school buildings. While thermally circulated air was used for the smaller schools, many larger school buildings were heated by mechanically circulated air.

Electric central station energy was by no means universal, and power for operating fans frequently was developed by gasoline and gas engines. For example around 1900, the large high school in Kansas City, Kan., had 12 cast-iron furnaces and a 25 hp. gasoline engine. The centrifugal type blower created a pressure around the furnaces and forced the air into two separate masonry plenum chambers, in one of which the air temperature was kept at about 130 F.; and the temperature in the other at about 60 F. The lower temperature was maintained by mixing a part of the unheated outside air with heated air through interconnected double dampers under thermostatic control. A separate single duct ran from these chambers to each classroom, having at its inlet double dampers each of which responded to a thermostat in the respective room.

This scheme has been revived during the present war emergency, under pressure of the Washington authorities, for use in many community buildings of housing projects.

#### Steam, All-Blast Heating

Steam, all-blast heating was developed and in wide use 50 years ago following the general scheme described for warm air furnaces in school buildings; particularly in the schools of Chicago, St. Louis, and Kansas City, and this system persists in modified form.

There was a steam convector called a tempering coil through which air from out of doors was drawn to the supply fan. Temperature control was obtained by a single blade by-pass damper around the tempering convector, permitting a graduated mixing of the two air streams to maintain the desired condition in the cooler of two plenum chambers. The fan forced this air through additional steam heated convectors into the warmer plenum chamber and from these two a separate air duct with thermostatically controlled mixing dampers supplied each room. The all-

blast steam heating system used an engine for fan power and the exhaust steam from the engine was condensed in the convectors.

The early custom was to confine this economizer action to one section or layer of the tempering convector in contact with the coldest air, but later practice was to install an oil separator and a pressure reducing valve and thus by providing a relatively low pressure in the heat transfer surfaces, to permit condensing all of the exhaust steam regardless of outside air temperature.

As electric energy became available with passage of the years the steam driven engines and pumps gradually have lost popularity and in most school building heating practice of today the fans and vacuum pumps are electric driven, and the plants can be attended by engineers of somewhat less skill and experience than was required with relatively high pressure power plants.

In some cities, particularly in the eastern part of the United States, the combined heating and ventilating plants in school buildings operated on a split system basis and continue to do so. In such an arrangement enough direct radiation is installed in each room to heat the room, while air at one temperature is forced by fans to all the rooms regardless of orientation or local heat sources. Such systems of heating usually were less economical of fuel than were the all-blast systems. This loss was occasioned partly because of greater heat transfer due to hot radiators against cold outside walls, partly because of less effective temperature control due to time lag in cooling the hot radiators and partly because the radiation in the first room to reach the desired temperature could not be utilized to help heat the remaining too-cool rooms.

With an all-blast system on the other hand, when the first room became warm enough the heat from the radiation which had accomplished it, this radiation being piled up near the fan, automatically was diverted to the remaining rooms.

#### Unit Heaters

When electric energy for driving fans became universally available, the very large central air supply fans and piled-up convectors, with exceedingly long separate air ducts running out to the rooms, were superseded by several smaller systems each with comparatively short ducts. This tendency in large buildings toward use of several smaller systems with heating convectors close to the rooms commenced about 1908 in many school buildings.

One of the first unit heaters using a centrifugal fan and pipe convector was patented back in the seventies but was not in general use until early in the present century. The present propeller type unit heater seems to have been inspired by an automobile engine-cooling hot water radiator.

#### Hot Water Heating

Hot water heating in 1894 was largely obtained by thermal circulation. The designing and installation required considerable skill, with delicate adjustments of the pitch of the take-off tees from mains so as to balance circulation. The mains were very large as

compared with present custom. One New York City concern, Evans-Almirall Co., did practice the rudiments of forced circulation hot water as is known today, but worked on a relatively low differential pressure, the mechanical circulation applying only to the mains, with thermal circulation for all branches and risers, and generally using an open expansion tank. This concern installed many large central station heating systems and was an outstanding pioneer in hot water heating. They developed fundamentally correct scientific methods for computing pipe sizes and temperature differentials.

The central heating plant at Ohio State University is an outstanding example of an early hot water heating system, in which the heat in exhaust steam from the electric generating plant is transferred to the hot water. This permits transmission of heat in underground mains to distant buildings without necessity for high back pressure at the exhaust steam outlets of the power plant.

#### **Automatic Temperature Control**

Automatic temperature control in 1894 was obtained largely by use of compressed air thermostats. The first successful automatic temperature regulating system seems to have been by a combination of direct current electricity with compressed air, but the electric equipment of those days was unreliable, and

by 1894 had been superseded by all-pneumatic systems.

The modern all-electric systems have been developed during the past 20 years. The present tendency seems to be to return more and more to a combination of both electric energy and compressed air, especially in the many complicated duties required when use of refrigeration and control of relative humidity enter the picture.

#### **History Repeats Itself**

Civilization seems to move in cycles and heating processes and methods seem to follow the same principle. Thus the underfeed coal stoker was old, fell into disrepute and became almost obsolete, only to be revived when the simple, worm-feed principle appeared. Spreader type stokers were used successfully 40 or more years ago and were almost forgotten only to stage a comeback which still is accelerating. Down-draft manual firing of boilers and furnaces was almost extinct when Kewanee brought out the successful down-draft steel fire-box boiler, which in turn was to be outmoded by the revived underfeed stoker and by the oil burner which atomized the fuel. There is evidence that, all things considered, a big down-draft, manually fired heating boiler burning bituminous coal can set an efficiency mark which other fuels and methods do not easily surpass.

# A PROGRAM FOR THE REPAIR AND MAINTENANCE OF SCHOOL FURNITURE

By **ALWIN J. HORN**

Superintendent of Repairs

**SAMUEL J. SUTHERLAND**

Stock Coordinator

and

Board of School Directors, Milwaukee, Wis.

ONE of the greatneses of the American public school system lies in its program of fostering and developing the natural traits and abilities of the children intrusted to its care. Under such a program, a pupil with a mechanical turn of mind is given instruction in the proper use of tools; while on the other hand, the artistically-minded youngster is encouraged to develop his latent talent to the fullest extent.

There is, however, one type of amateur artist for which authorities seem to have little appreciation. We refer to the seat-top and furniture sculptor who, in his idle moments, devotes his time to "beautifying" the top of his classroom seat with examples of his technique. Educational efforts by school administrators to develop a full sense of social responsibility in students and school personnel has reduced this type of vandalism to a great extent in Milwaukee; isolated cases do occur, however.

The great problem in Milwaukee, as in all school systems, is that of repairing and maintaining school furniture that has become worn or damaged under the daily wear-and-tear of ordinary use. In preparing our annual program of furniture maintenance, we are guided by our previous expenditures to a great extent. Careful analysis of the amounts spent over a long period of years makes it possible to gauge accurately the amount to be expended annually for the various operations required to maintain properly our school buildings. The amount actually budgeted for this purpose, however, is governed by the tax income for the corresponding period, since in Milwaukee there is established a separate tax for the repair and maintenance of school structures.

## Repair and Refinishing Allowances

The object of the maintenance program is to attempt to limit the time intervening between the complete rehabilitations of any Milwaukee school building to not more than eight years. The actual intervening time varies from five to eight years, depending upon the conditions of location, exposure, type of construction, age of building, class of occupants, intensity of use, and such pertinent factors.

A portion of the money expended for the overhaul-

ing of a building is allocated for the refinishing of the furniture. In 1944, \$47,695 has been provided for the painting work in connection with the reconditioning of two school buildings, and \$19,154 for the carpenter work on these projects. Almost exactly 25 per cent of the painting cost, or \$11,804, is earmarked for refinishing the furniture in these buildings. In schools subjected to unusually severe use, such as evening social center and recreational activities, the period between complete overhauls is too long; therefore, an intermediate furniture repairing and refinishing allowance is set up. In 1944 this sum will amount to \$6,184 for painting work and \$7,458 for carpentry work. These amounts are broken down as follows:

	Labor	Material	Total
Painting work .....	\$5,582	\$602	\$6,184
Carpentry work .....	6,538	920	7,458

It should be understood that, because of wartime conditions, these figures do not represent the usual appropriations for this type of work. On the basis of more than 100 school buildings, it would be necessary to recondition no less than 16 schools per year to comply with the minimum conditions of the schedule.

## Central Service Refinishing

It is the Milwaukee School Board's policy to maintain an inventory of refinished seats as replacements for seats removed from the schools for refinishing. This inventory is replenished by refinishing school seats on a production basis in our central Service Building so as to keep the unit cost as low as possible. The procedure of refinishing includes:

1. The removal of the old finish;
2. The repair or replacement of any broken portions of the seat;
3. Preparation of the unit for refinishing; and
4. The final refinishing operations.

Seats which need refinishing, after removal from the school building, are accumulated until approximately 500 have been collected. A group of 500 or more is



then put through the standard refinishing process.

The removal of the old finish is accomplished by dipping the entire seat in a hot caustic alkaline solution of  $78\frac{1}{2}$  lb. of sodium-carbonate and  $11\frac{1}{2}$  lb. of sodium-hydrate to 100 gal. of boiling water. The seats remain in this boiling solution for from one to three minutes, depending upon the condition of the finish and the kind of varnish previously used. The seat is then removed from the tank and the solution is flushed off with hot water. After the flushing, the seat is dipped in a boiling hot bleach solution of oxalic acid, made by dissolving approximately 21 lb. of oxalic acid crystals in 100 gal. of boiling water. The bleaching liquid is also washed off, and the seats then dried as rapidly as possible by storage in a hot room. The accompanying photographs show the tanks used for the alkaline and bleaching solutions. The tank containing the caustic liquid is large enough to treat two seats at one time, while the bleach tank accommodates one seat. The tanks are equipped with gas heaters to keep the liquids constantly at the boiling point.

When thoroughly dry, the seats are repaired. New tops and seat sections are installed where required; broken hardware is replaced; and the entire unit completely reconditioned. Wooden portions of the seats are scraped and sanded just before refinishing.

The refinishing operations consist of staining the wood to a standard school brown color, followed by one coat of thin shellac (two-pound cut) and two coats of a special seat varnish, the final coat of which is applied at the school after the seats have been installed. All wood surfaces are sanded with 3-0 sandpaper following the shellacking operation and before the final varnish coat.

When a school is about to be repainted, the seats are removed; and after the painting work has been completed, refinished seats from stock are installed. Care is exercised so that, insofar as possible, seats of the same manufacture are used for replacements since the fastenings of one make of seats are usually spaced differently from those of any other. In this way, the same screw holes in the floor are used for fastening the replacements as for the original installation.

The cost of this method of refinishing fluctuates widely, depending upon the condition of the seats. The cost of repairing and refinishing some 2300 seats in the past year has averaged \$3.156 per unit, varying from \$2.13 to \$3.84. This average cost is distributed approximately as follows: painting work, \$1.00; carpentry work, \$2.00; cartage and incidentals, \$0.156. Thus the carpentry work required 67 per cent of the total, and the removal of the old finish and the painting operations required about 33 per cent.

#### Refinishing at One School Building

When, because of changes in school population, it is necessary to replace seats in only one or two class-

rooms, it has been found more satisfactory to carry on the cleaning, repairing, and refinishing operations at the school itself, without removing the seats. While the unit cost of the operation is considerably higher, it is uneconomical to prepare the caustic and bleaching solutions and equipment for a small number of units. It is interesting to note, however, that while the carpentry and finishing work is roughly approximate wherever the repair operations are conducted, the removal of the old finish from seats costs only 12 cents a unit when done at the central location, but this operation at the school building costs nearly 60 cents a seat. This is explained by the fact that a crew of three men can remove the varnish from and bleach at least 250 seats per day, while a crew of four men working at a school under the best possible conditions will prepare not more than 80 seats per day. While the cost of the varnish remover required is considerably in excess of the caustic and bleaching chemicals and the cleaning of the floor after the conditioning adds additional cost to the operations when done at the school, on the other hand there is a saving in cartage and incidentals which will reduce the net differential to about 45 cents a unit.

In all instances, furniture (such as tables, chairs, and desks) having glued construction of a type subject to injury by the boiling solutions is refinished in the customary manner of removing the old finish with varnish remover, followed by scraping and sanding, staining, shellacking, and varnishing. The usual cost of completely refinishing a flat-top double pedestal desk is about \$6.00, exclusive of any carpentry work.

In removing the finish from the seats at a school, three applications of varnish remover are usually



After the old finish has been removed, the seats are scraped and sanded just prior to refinishing



Hot caustic is flushed off with water. Tank containing the bleaching solution is at left

Application of the first coat of special seat varnish. The final coat is applied after the seat has been installed at the school building



necessary before the old varnish is completely removed. The softened varnish is scraped off with a metal scraper, followed by a final rubbing with steel wool. The varnish remover is neutralized by the application of a tepid solution of one-half pound of commercial sal soda or washing soda in one gallon of water.

#### Finishing Materials

One of the important considerations in refinishing operations is the use of proper finishing materials. The Repair Division has made exhaustive tests on many brands of varnish as to color, setting time, drying time, workability, brushing qualities, abrasion resistance, and so forth. On the basis of these tests, Milwaukee has standardized on one brand of varnish which, surprisingly, was not the most expensive one tested. For repainting the metal portions of the seats, a quick-drying black metal varnish is used. All finishing work is done by hand; no materials are sprayed because of our inability to comply with structural requirements of the local health code.

#### Dealing with Furniture Sculptor

At the beginning of this article, we mentioned the furniture sculptor who is always a problem for the school repair and maintenance department. The apprehension and social education of any vandal is a function of the teacher and school administrator, and punishment is his sole providence. The Repair Division, however, has recommended charges for the repair of school desks for the guidance of the school principal in collecting for damaged seats. A charge of \$1.00 is recommended if the seat top has been damaged so badly that a new top is required. If the finish has been damaged and a refinishing operation only is required, the recommended charge is 50 cents. These are only recommendations, and the actual charge can be adjusted by the principal as he deems best to fit the individual case.

Milwaukee has experienced the same problems in the financing of repair programs to a greater or lesser degree as other school systems. We try to rehabili-



The seat is allowed to remain in hot caustic solution for from one and one-half to three minutes. This tank accommodates two seats at the same time

tate each school building every eight years, but often the funds available will not support such a program. We have been able, by careful planning and budgeting of the funds at hand, to preserve our school furniture in a useful and reasonably presentable condition.



# CUSTODIAL SUPPLIES

BOARD OF EDUCATION  
OF THE CITY OF

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Battery, Flashlight .....			
Belt, Dressing .....			

Item No.	Article—Or Equal	Unit	Price per Unit
83-4057	Bag, Burlap, 35" x 45" .....	each	.34*
83-4157	Cloths for Cleaning, 28" x 28" .....	each	.18
	(Packed 24 to a bundle. When possible please order in multiples of 24.)		
83-4407	Waste, Cotton, in 25-lb. bale pkgs. ....	pkg.	2.75*
83-7467	Flag, Intermediate, 14' x 7'-6" .....	each	6.00
83-7487	Flag, Storm, 8' x 4'-2" .....	each	2.58

### CORDAGE AND ROPE PRODUCTS

85-4907	Mats, Coir .....		
85-4957	Mats, P .....		

## MAKING THE BEST USE OF CUSTODIAL EQUIPMENT AND SUPPLIES

By N. L. GEORGE

Director of Business, Oklahoma City Public Schools

THE cost of labor is about 90 to 95 per cent of the total cost of good housekeeping of a school building. Consequently, it is very important that the supplies and equipment used by the custodian be of such quality and possess such durability that the ratio of the cost of labor to the total cost remain about the same. To accomplish this control there is need for a comprehensive policy of purchasing, distributing, and utilizing the supplies and equipment for custodians.

### The Inventory

A first step is to make a careful inventory of the supplies and equipment each school unit has on hand at a stated time. The inventory should state the

needs for the next year or for any stated interval of buying.

After this survey is completed and tabulated, the administrator in charge of purchasing should set up specifications and purchase the needed supplies and equipment in accordance with sound principles of purchasing.

### Selecting Equipment

The problem of selection is very important. Poor selection may mean premature discarding of supplies or throwing away of a piece of equipment. Poor selection may also dampen the enthusiasm of the employees and cause them to discard good practices. Likewise, low initial cost may mean excessive main-

tenance costs and premature replacements. On the other hand, a high initial cost which has the effect of lowering other expenditures may be more economical.

Therefore as most custodial supplies and equipment are expendable over a period of two to three years, what are the factors to be considered in their selection? First, will this particular supply or piece of equipment do the job or perform the function for which it is purchased? how well? how long? Second, will it facilitate in the operation of the plant? Third, is the cost reasonable for the quality and service contemplated?

#### **Accounting System**

As soon as the supplies are purchased a record of the purchases should be made on storeroom records. This statement reveals the firm from whom the purchase was made, the cost of the article or articles, the number of articles purchased, and the purchase order number of the general accounting system.

On receipt of the purchased articles at the central storeroom an entry should be made as received. Then, as the articles are distributed to the several units of the school system, entries should be posted from signed delivery tickets and entered by code numbers to that unit.

#### **Training in Proper Use**

After the article is assigned and delivered to the school unit, the human factor of the use of the arti-

cle presents itself. Carefully trained custodial personnel is necessary for the best economical use. Frequently schools of instruction are necessary to show this staff where, when, why, and how to use the supplies and equipment.

Instruction to the staff should include ideas and ways of protecting and conserving the supplies which are used for specific jobs in each unit, the proper care of the items which are irreplaceable, the necessity of immediate repair on some item, and how to rehabilitate old equipment or use substitutes. Frequently these ideas may be conveyed to the custodial personnel in group meetings, building meetings, or by a central administrative official who furnishes help on special housekeeping problems.

#### **Conclusion**

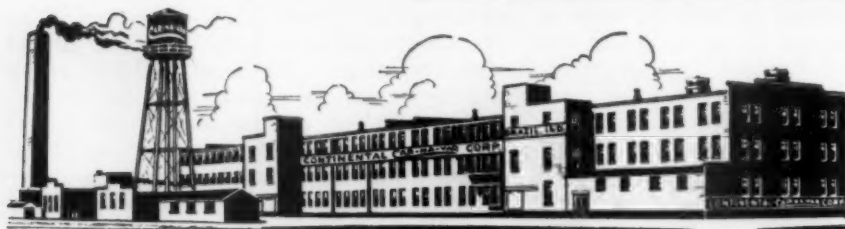
To sum up, the principles of cost control for custodial supplies and equipment are:

1. That authorities adhere to sound principles in purchasing.
2. That safeguards be established for the protection of supplies and equipment from loss.
3. That an adequate accounting system be established which will safeguard and check management.
4. That careful attention be given to potential waste or uneconomical use.
5. That all employees cooperate with the administrator, and use the supplies for their intended purposes.

# CONTINENTAL CAR-NA-VAR CORPORATION

1527-29 E. National Ave., Brazil, Indiana

WAREHOUSES AND EXPERIENCED FLOOR MAINTENANCE ENGINEERS IN PRINCIPAL CITIES OF THE U. S. A.



World's Largest  
Manufacturers Specializing in  
**FLOOR TREATMENTS FOR  
LARGE FLOOR AREAS IN  
SCHOOLS AND UNIVERSITIES**

## ● RELIABILITY

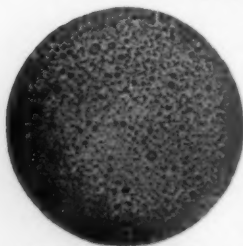
For many years we have specialized in the manufacture of floor treatments for large floor areas and are today the largest manufacturer in the world devoted to this field. For that reason we have the experience and facilities for producing the most efficient products. Balance these points against the following three classes of competitive materials . . . those primarily designed for the less severe strain of the dwelling . . . those finishes offered as mere side-lines by general manufacturers . . . and those materials made by small, inexperienced concerns with little or no responsibility.

We have many trained floor engineers in the field who service our products to see that the customer obtains maximum efficiency. Dun & Bradstreet gives us high first class rating. We are incorporated for \$1,000,000. Our products are in use in all parts of the world, including the Army and Navy. They are approved by the leading manufacturers of floors and endorsed by thousands of users.

## ● SERVICE OFFICES

Service offices and warehouses in principal cities of the United States with an experienced floor maintenance engineer in charge of each.

## CAR-NA-VAR FLOOR TREATMENTS ARE SCIENTIFICALLY MADE



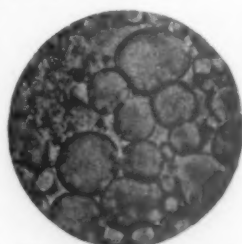
Microphotograph No. 1

Car-Na-Var Floor Treatment compounds are made of the best materials available. Despite wartime difficulties, they are still made in strict accord with original formula . . . **no substitutions!** In our modern factory these raw materials are tested for uniformity, blended by expert chemists, processed by special processing equipment and finally tested for uniformity of the finished product.

The special processing breaks the globules of varnish gums and waxes into minute particles as shown in Microphotograph No. 1 above. This proc-

essing insures greater covering capacity, greater penetration, greater wearing qualities, and because of perfect distribution, freedom from slipperiness. Microphotograph No. 1 shows what Car-Na-Var products look like when magnified two thousand times. Compare this with the coarse globules of wax and gums in ordinary floor treatments as shown in Microphotograph No. 2, also magnified two thousand times.

Car-Na-Var products are better products because they are scientifically and accurately made.



Microphotograph No. 2



## MOST DURABLE FLOOR TREATMENT EVER MADE

Car-Na-Var is the original varnish-gum and wax floor treatment that combines the durability of varnish with the scratch-resisting qualities of wax. Gives a beautiful, lustrous WATERPROOF finish to all types of floors except rubber and asphalt . . . is non-slippery. Car-Na-Var requires no undercoat of sealer . . . although it is readily applied over any seal. Use Car-Na-Var if you have an electric floor machine for buffing . . . it requires more initial labor than a self-polishing wax but is much longer lasting. Applied with a mop; ready for use in an hour. Supplied in "natural" (stainless), Dark Oak, Light Oak, Walnut, Cherry, Mahogany, Maroon, Olive Green and Mission. Meets U. S. Treasury specification for "Undercoater A" and Item 7 of proposed Federal specifications.

THE AMERICAN SCHOOL AND UNIVERSITY—1944

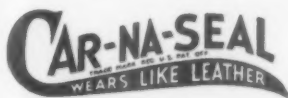


If you do not have a floor machine or buffer, or object to polishing, use Car-Na-Lac . . . it is "self-polishing." Radically different from all other self-polishing floor treatments! Easily applied with mop or cloth, it goes on like lacquer . . . leveling itself out to a brilliant streakless luster . . . dries like wax in less than 30 minutes. Can be used on all types of smooth, sealed or fairly non-porous floors including rubber and asphalt. Waterproof . . . non-slippery. Meets U. S. Treasury specifications for "Finish Material" (except for percentage of solids), and Item 9, Type I of proposed Federal specifications.



A super-finish for floors; made and applied in exactly the same way as Car-Na-Lac but contains about 38% more solid content. Designed for extra heavy duty. Recommended by a large Casualty insurance company for safety. Meets U. S. Treasury Department specifications for "Finish Material" and Item 9, Type II of proposed Federal specifications.





### SPECIALLY DEVELOPED FOR GYMNASIUM FLOORS

A deep-penetrating seal for all wood floors—tough as leather and thoroughly pliable—that gives a smooth satin-like luster, free from streaks and scratches. Car-Na-Seal requires no buffing. Marks left by rubber soles (rubber burns) are easily removed. Made from Bakelite and other phenolic resins, specially processed for longer wear. Although used frequently as an undercoater for Car-Na-Lac, Continental "18" and Car-Na-Var, Car-Na-Seal is an ideal top dressing for gymnasium floors. Provides a firm, safe footing. Preserves the floor by excluding moisture and dirt from the pores . . . protects markings of basketball court, etc. Car-Na-Seal also provides an excellent finish for school desks. *Meets U. S. Treasury specifications for "Sealer C." Average coverage 500 sq. ft. per gallon, and Item 5, Type J of proposed Federal specifications.*



Two coats of Car-Na-Seal, applied once each year, keeps the 6000 sq. ft. gymnasium floor of the Highland Public School, Highland, Illinois, in tip top shape



The thinners used in floor waxes and other treatments, while harmless to most floorings, are usually highly injurious to rubber and in the case of

certain soft composition floors cause the colors to run. In view of this, we have taken the solid content of Car-Na-Var (which combines varnish gums and hard waxes) and emulsified it to use on rubber and composition floors. The result is "Rubber-Var."

Rubber-Var is waterproof and is applied with a mop, drying almost as fast as it is applied. It is then polished by buffing, responding to a very high polish. Rubber-Var forms a protective coating for rubber or soft composition floors, preserving them from their natural enemies—oils, air and the friction of traffic; also making the rubber or soft composition floor much easier to clean and keep clean, eliminating the need of frequent scrubbing. It also prevents colors from "running." Longer lasting than self-polishing waxes. Waterproof. *Meets U. S. Treasury specifications for "Undercoater B" and Item 8 of proposed Federal specifications.*

### SILENT CHIEF ELECTRIC FLOOR MACHINE



Like driving a high-powered automobile, the "Silent Chief" actually runs itself . . . you merely hold lightly onto the handle to steer. Special geared-head motor gives maximum efficiency . . . yet hours of polishing, scrubbing, steel wooling, sanding or grinding will not tire the operator because its perfect balance calls for no physical effort. Can be easily converted into a rug-scrubbing machine. Available in 5 sizes.

**CAR-NA-PAINT**—Car-Na-Paint for floors is made by grinding color pigment into Car-Na-Seal, giving the same very durable, flexible finish as Car-Na-Seal. Because it is highly alkali and acid-resisting, Car-Na-Paint is especially

adapted for concrete floors. Applied with paint brush. Coverage same as Car-Na-Seal. Supplied in following colors: Light Gray, Dark Battleship Gray, Maroon, Dark Brown, Battleship Brown, Tile Red and Green. *Meets Item 5, Type III of proposed Federal specifications.*

**DE-TER-GO**—De-Ter-Go is a white powder, manufactured by a special process resulting in a cleaning agent of most remarkable qualities; a cleaner so mild that it may be handled freely, may be used in the bath, and yet so powerful, when properly used, that it will remove paint and varnish. For cleaning oil-soaked floors it has no equal, removing the surface oil and restoring the former color of the floor without harming the floor. De-Ter-Go is also especially adapted for cleaning rubber floors. *Meets U. S. Treasury specifications for "Cleaner B," and Item 2 of proposed Federal specifications.*

**CLEAN-O-SHINE**—Clean-O-Shine is a cleaner of a creamy consistency and is free from alkali, acids or abrasives and therefore harmless to the finest finish; at the same time, it is a highly efficient cleaner. Being made of a high grade vegetable oil, it is, in fact, a "floor food" and if not rinsed after scrubbing, acts as a filler on porous surfaces, while on varnished or painted surfaces it renews the luster and forms a protective coating. It possesses a very pleasant, sanitary fragrance which has a decided deodorizing effect, eliminates the smell of wet wood, soapsuds, etc., as well as other disagreeable odors. If to be followed with Car-Na-Var, Car-Na-Lac, etc., floor should be rinsed free of Clean-O-Shine. *Meets U. S. Treasury Department specifications for "Cleaner A," and Item 1 of proposed Federal specifications.*

### CAR-NA-VAR PORTABLE VACUUM

#### For Wet and Dry Pick-up

Never before has a portable heavy duty vacuum machine offered such powerful cleaning action plus such quiet operation . . . quieter even than a small household machine. Designed for both "wet" and dry pick-up, the new silent Car-Na-Var is an ideal machine for the school, where quiet and cleanliness are of equal importance in the daily routine. The new compact design makes the Car-Na-Var easier to use, easier to keep clean. New sturdy construction means trouble-free operation . . . longer life.



Picks up  
6 ft.  
"2 x 4"

### FREE BOOK!

Tells how 18 superintendents and building managers of important schools, hospitals, office buildings and other public institutions cut floor maintenance costs. Gives actual figures and specific details. Sent FREE to maintenance executives. Write for your copy today . . . on your business stationery, please. There's no obligation attached.

# THE SELIG COMPANY, INC.

DALLAS ATLANTA NEW ORLEANS

Manufacturers of  
Disinfectants — Insecticides — Sanitary Supplies

ESTABLISHED 1896



Library, Agnes Scott College, Decatur, Ga.  
Asphalt Tile Floor finished with O-Brite-O

## O-BRITE-O

Those desiring a really fine self-polishing wax will find O-Brite-O to be above the usual. O-Brite-O really dries with a shine. Because of its unusually high content of the finest number one pure Carnauba wax unadulterated by cheaper, inferior soft waxes; O-Brite-O, when dry, leaves a hard resilient long wearing surface. It is easily maintained and not only wears well but looks well. A trial will certainly convince you. O-BRITE-O IS SAFE TO USE ON ANY TYPE OF FLOOR.

## VARNAWAX

A high grade wax of strictly number one pure refined Carnauba wax combined with certain varnish gums in an oil solvent vehicle. Varnawax produces a hard resilient, water proof surface that looks well and wears well. Varnawax requires polishing and may be used on all floors except asphalt and rubber or other floors harmed by an oil solvent.

## SCRUBZOL

A strictly neutral linseed oil cleanser especially developed and approved for cleaning Wood, Linoleum, Cork, Asphalt Tile, Marble, Terrazzo, Travertine, Magnesite, Masonite and other similar floors. Scrubzol is a concentrated product thus permitting a little to go a long way and do a big job—satisfactorily and economically. Don't take our word for it. Try it and prove it to your own satisfaction.

## VARNASEAL

You'll find the answer to your Terrazzo and Travertine problems in Varnaseal. Seal these floors against the entrance of dirt, grease, oil, stains and foreign matter with Varnaseal. It is easy to apply, makes maintenance easier and gives your Terrazzo or Travertine the kind of protection needed. Lower your maintenance costs with Varnaseal.



WRITE FOR FLOOR MANUAL



THE AMERICAN SCHOOL AND UNIVERSITY—1944

*Below: Gymnasium, Lee Edwards School, Asheville, N. C.*

Finished with Selig's JIM KOTE



#### JIM KOTE

A mighty fine, chemically balanced bakelite and tung oil gymnasium finish. Does not rubber burn, impervious to alkali, salt water, alcohol and common acids. Easily maintained. Plenty of traction. An ideal finish. Our numerous satisfied customers are, we believe, the best judges. Their complete satisfaction makes us believe you also will be pleased. Jim Kote is easily applied by the mopping method.

#### FLOR-O-SEAL

Especially developed for classroom use. This penetrating seal, when properly applied, does not leave a surface film. Thus, Flor-O-Seal does not show unsightly traffic lanes. It wears well, is easily maintained and is economical. The application is very easy and simple.

#### FLOOR MAINTENANCE SERVICE

The SELIG trained and experienced floor maintenance engineers are qualified to assist you in any problem of scientific floor finishing and maintenance. They will gladly assist you in setting up the proper and most economical schedule of maintenance. Please discuss your problems with us freely.

We manufacture a complete line of floor maintenance materials and equipment. Our various materials have been approved by the leading makers of flooring materials such as Wood, Linoleum, Cork, Rubber and Asphalt Tile, Marble, Terrazzo, Magnesite, Masonite, etc.

#### DISINFECTANTS — INSECTICIDES — LIQUID TOILET SOAPS

In addition to the famous line of floor materials, the name SELIG has been synonymous with the highest standards of Disinfectants, Insecticides, Liquid Toilet Soaps and Sanitary Supplies for nearly fifty years.

Put your problems up to us and permit us to offer suggestions and advice. There's no obligation involved and it may be of mutual benefit. Write for our big free complete catalogue.

**THE SELIG COMPANY, INC.**  
DALLAS                      ATLANTA                      NEW ORLEANS



Manufacturers of  
Floor Finishes — Waxes — Cleansers — Polishes

ESTABLISHED 1896



THE AMERICAN SCHOOL AND UNIVERSITY—1944



# ADVANCE MACHINE COMPANY, INC.

2605 Fourth Street S. E., Minneapolis 14, Minnesota

## One Machine SCRUBS — STEEL WOOLS — WAXES or POLISHES All Types of Floors

For rapid, profitable maintenance work on all kinds of floors—investigate what Advance has to offer you. For quiet, vibrationless operation—you'll find them unexcelled. The "Lowboy" design saves time and work and makes it easy to clean well in all the corners and under equipment. Hundreds of schools have for years profited by Advance dependability. (Names on request.)



*Its speed, quietness, thoroughness and long life make it the ideal machine for school use*



ADVANCE "Lowboy" is built low enough to get under desks easily

Lowboy 12

Lowboy 15

Lowboy 16

Lowboy 21

**LOWBOY 12**— $\frac{1}{4}$  H.P. Motor. Brush spread 12"—brush speed 320 R.P.M. Single brush, 3 segments. Height over brushes,  $5\frac{3}{4}$ ". Silent V-Belt drive. ADVANCE patented brush holder makes brush changing quick and easy. Both scrubbing and polishing brushes included.  $2\frac{1}{2}$  gal. automatic dispensing tank extra.

**LOWBOY 15**— $\frac{1}{2}$  H.P. Motor. Brush spread 15"—brush speed 320 R.P.M. Single brush, 4 segments. Height over brushes,  $5\frac{3}{4}$ ".

**LOWBOY 16**— $\frac{1}{2}$  H.P. Heavy Duty Ball Bearing Motor. Brush spread 16"—brush speed 375 R.P.M. Twin brushes, 3 segments each. Height over brushes,  $6\frac{1}{4}$ ". Opposite rotation assures perfect balance—no side pull. Spiral worm gear drive. Same equipment as above. A splendid machine for all general utility use.

**LOWBOY 21**— $\frac{1}{2}$  H.P. Heavy Duty Ball Bearing Motor. Brush spread 21"—brush speed 275 R.P.M. Height over brushes,  $7\frac{1}{4}$ ". Same design and equipment as Lowboy 16. LOWBOY 21 is recommended for large areas and heavy duty service. Built to outlast and outperform any other machine.

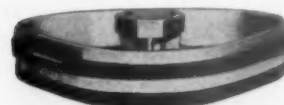
### BRUSHES EASILY CHANGED

With the ADVANCE patented brush holder it takes but a moment to insert the brushes needed for the work at hand.



### A BRUSH FOR EVERY PURPOSE

Brushes may be obtained in bassine, palmetto, tampico, steel wire, etc., for scrubbing, waxing, polishing, scouring, etc.



### STEEL WOOLING

For steel wooling, burnishing or light sanding, suitable attachments can be furnished.

# ADVANCE "Lowboy" ELECTRIC FLOOR MACHINES

THE AMERICAN SCHOOL AND UNIVERSITY—1944

# GEERPRES WRINGER, INC.

Muskegon, Michigan

## A GEERPRES

### Floor Cleaning Unit

certainly does take the mess out of mopping! A single downward stroke of the lever, and the mop is wrung out and ready for use on the floor, enabling the school janitor to wash and rinse floors quickly and thoroughly.

The Floor Cleaning Unit consists of a long-lived GEERPRES Wringer, of the famous downward pressure type, making it splashless and safe. The Tank on its Chassis has ball bearing casters, with soft rubber wheels. This eliminates injury to your floor, with less noise in operation. This Unit is available in two sizes, with single or twin tank models.

### Advantages

Long time service—no parts to crack or warp—no splash—no rust.

Will not mar or scratch floors.

Preserves mops in the best condition for rapid mopping.

Wrings quickly and uniformly, with no loose mop strings to catch around legs of chairs and tables. Force is exerted downward upon the mop, the natural way for the water to flow.

Simple in operation—a downward stroke of the lever extracts the water.

Fully guaranteed.

## GEERPRES MOP WRINGERS & TANKS



Pictured at right—

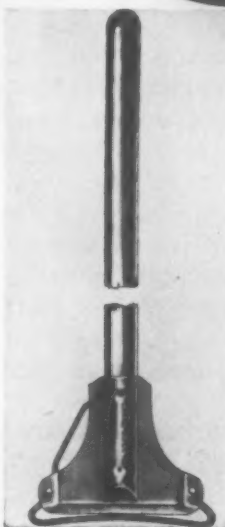
GEERPRES Tangle-

proof MOP STICK

Note that there are no screws nor clamps to tangle mops or injure furniture.

This mop stick will accommodate any size mop from a 16-ounce to a 36-ounce inclusive.

The mop is securely held in place by an automatic self-adjusting spring tension.



Below (center)

GEERPRES UNIT No. 2436

Consists of wringer for all sizes of mops from 20-ounce to 36-ounce, single tank and chassis. The Wringer has double-staggered, non-slipping gears; extra long handle with large rubber grips; rust resistant finish; electric arc welded construction. The wringer fits round or square containers. Weight 17 pounds. Width of wringer inside mop compartment, 7 1/4"; length inside, 9 1/4"; depth when open, 7 3/4". Height of complete unit to top of handle extended, 39".



NOTE:  
Gears are enclosed.

Gear Shaft

Size Increased

Will Not

Warp Under

Excessive Strains

Double, Staggered

Gears Cannot

Possibly Side Slip

Patented



Write for further information concerning **GEERPRES** Mopping Equipment.

Below (right)

GEERPRES UNIT No. 1624

Consists of wringer for mops from 14-ounce to 24-ounce. Fits round or square container. Has double-staggered, non-slip gears. Made of steel, fully guaranteed. Rust resistant finish. Width of wringer inside mop compartment 6"; length inside 8 1/4"; depth, open, 7 1/2". Height of unit including wringer handle, 31". Tank capacity 32 quarts. Weight of complete outfit—wringer, tank and chassis—25 pounds.



Pictured below—

TWIN TANK UNIT No. 1624T

Consists of one wringer, two 32-quart removable galvanized tanks, one two-compartment chassis with 24" x 1" rubber bumper on each end. Length 31". Width 17". Approximate weight 47 pounds. Wringer and chassis, rust resistant finish. A similar unit—No. 2436T—is made with larger tanks (44-quart), length 33", width 18", approximate weight 60 pounds. Wringers in all models have double-staggered gears which cannot possibly side-slip. All models have double ball-bearing casters and soft rubber wheels.



THE AMERICAN SCHOOL AND UNIVERSITY—1944

# FIBRCAN CORP.

Whitestone, N. Y.

## FIBRCAN

### Waste Receptacles

Made from Case-hardened Fibre Reinforced for Longer Wear

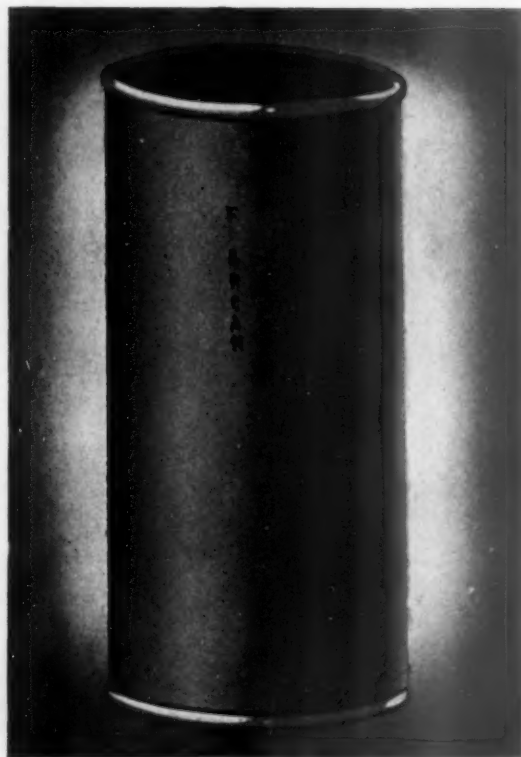


**Above—No. 2**  
Height, 15"; top diameter, 12"; bottom diameter, 10". Available in 2 colors: Olive green and brown. Packed 1 dozen of one color to a carton.

Schools are finding many uses for FIBRCAN, the only patented fibre waste receptacle—in classrooms, washrooms, kitchens, cafeterias, hallways, etc. FIBRCAN is neat and attractive, light-weight yet sturdy, non-rusting, and not easily dented. A seamless steel ring at the top adds strength, and the reinforced spun steel bottom is raised one inch from the floor to comply with Underwriters Laboratories specifications.

**Below—No. C-110**  
Height, 30"; three diameters: 16", 18" and 20". Colors: Brown and olive green. Packing: One to a carton. This giant-size receptacle is recommended for all refuse use.

**At right—9-V & 10-V**  
Style 9-V is 20" in height; 10-V, 30". Both styles, 12" diameter. Colors: Brown and olive green. 9-V is packed four to a carton; 10-V, two to a carton. This style is designed for use in washrooms, at drinking fountains, etc.



**At right—No. C-150**

This FIBRCAN "skater" is a twin to style C-110, but with composition wheels added for mobility. It is widely used for the collection of waste by school janitors, who appreciate its "fingertip" control, its noiseless efficiency.

#### Outstanding Features

- A. Die-cut hand-holes.
- B. Wooden cross members at base, for added support and bracing.
- C. Noiseless casters, harmless to floor surfaces.
- D. Dentproof; crackproof.
- E. 6" fibre kick-plate at base.
- F. Double rolled heavy seamless steel ring at top; steel bottom riveted to walls of fibre.



Colors: Dark brown or olive green.  
Sizes: 16, 18 or 20" diameter; 30" height.

Material: Extra heavy case-hardened fibre with steel trimmings.

Packing: One to a carton.

Weights: 14, 17, 18 lbs.



# THE FULLER BRUSH COMPANY

INDUSTRIAL DIVISION

3593A Main Street

Hartford, Conn.

World's Largest Manufacturers of School Cleaning Equipment



Library, Burns School, Hartford, Conn.

Take a Leaf  
from the  
Experience  
of School  
Authorities—  
They  
recommend  
**FULLER  
BRUSHES**

**Y**EARS of experience have taught School Superintendents, Purchasing Agents and Janitors that there's nothing equal to Fuller Brushes and Cleaning Equipment for quality and long service.

The maintenance of high standards of cleanliness in schools and similar institutions is of vital importance.

You can profit from this experience by adopting these tried and proven Cleaning Tools. They represent real value for your brush dollar. Send for our complete Catalog.

## There's a Fuller Tool for Every School Cleaning Need



# THE HILLYARD COMPANY

BRANCHES IN  
PRINCIPAL CITIES

St. Joseph  
Missouri, U. S. A.

DISTRIBUTORS FOR  
HILLYARD CHEMICAL CO.

A Floor Treatment, Maintenance and Sanitation Manufacturer  
with National Organization of Trained Engineers  
Over Thirty-six Years Continuous Service

## WOOD FLOORS

For Armories, Barracks, Recreation Centers, Class Rooms, Industrial, Commercial, Corridors, Dance Floors, etc.

Hillyard's Seals and Finishes are endorsed by the Maple Flooring Manufacturers' Association and by the National Oak Flooring Manufacturers' Association and have been specified by architects for years.

### PENETRATING SEAL AND WAX

This treatment for sealing wood floors replaces natural rosins, fills voids and canals, feeds cells of wood, expanding and hardening the floor, giving a surface that can withstand severe abuse without showing traffic lanes or wear.

(1) **First Coat**—After final sanding the floor should be thoroughly swept. Then apply liberal amount of Penetrating Seal No. 21 with mop or applicator, applying the seal, first across the grain, then rub with the grain of the wood, allowing for as much penetration as possible. Allow to dry 12 to 24 hours according to drying conditions. Temperature of floor and room shall not be less than 70 degrees.

(2) **Second Coat**—Steel wool with No. 3 steel wool. For quickest and best results, use steel-wooling machine such as Hillyard's Steeltonian. Sweep floor thoroughly and apply second coat of Penetrating Seal No. 21, applying with grain, covering no more than 250 sq. ft. to the gallon. Allow 12 to 24 hours drying time, and then the floor should be steel-wooled to remove raised grain or nap. Temperature of floor and room shall not be less than 70 degrees at time of application.

(3) **Wax Finish**—All areas shall be swept free of dust and dirt, and two coats of Hil-Brite Self-Polishing Wax shall be applied according to directions.

(4) **Reconditioning Sealed Floors**—On floors that show traffic lanes, scrub the floor to remove all dressings, waxes, dirt, etc. Allow to dry, then apply Hillyard's Penetrating Seal No. 21 with sheepskin applicator, spreading with grain of the wood. Allow 12 to 24 hours drying time, according to drying conditions, then buff entire area with No. 3 steel wool, preferably with electrically driven steel-wooling equipment such as Hillyard's Steeltonian. Temperature of floor and room shall not be less than 70 degrees.

(5) **Reconditioning Oiled Floors**—Onto the oiled floor shall be spread a Shine-All solution consisting of 1 part of Shine-All to 7 parts water (use hot water). This solution shall be agitated for several minutes, preferably with electrically driven equipment such as Hillyard's Steeltonian or Hiltonian. The suspended oil and grime shall be removed from the floor with squeegee and pickup pan. Process shall be repeated, then the floor should be rinsed with clear water. Allow to dry thoroughly. Two coats of Penetrating Seal No. 21 shall then be applied in manner given in (1) and (2). Temperature of floor and room shall not be less than 70 degrees.

(6) **Maintenance** — Easy and economical — simply sweep with Hiltone treated cotton sweeping brush according to directions.



THE AMERICAN SCHOOL AND UNIVERSITY—1944

## GYMNASIUM FLOORS—(Wood)

### TREATMENT WITH SUPER GYM FINISH

Endorsed by Maple Flooring Manufacturers' Association and National Oak Flooring Manufacturers' Association and backed by more than one-third of a century of practical experience.

### TREATMENT OF GYM FLOORS

This treatment produces a guaranteed non-skid, non-rub-burn finish that is long wearing and will add a non-glare lustre to the floor that will not turn dark or yellow with age.

(1) **First Coat**—Sanded or scrubbed floor should be first sealed with Hillyard's Wood Primer, applied liberally and spread evenly with lambswool applicator or brush. Allow 18 hours for thorough drying, then steel wool to remove raised grain or nap. Temperature of floor and room shall not be less than 70 degrees.

(2) All markings for athletic games shall be painted on top of the prime coat.

(3) **Second and Third Coats**—Apply two coats of Hillyard's Super Gym Finish according to directions, allowing 24 hours to elapse between coats. Steel-wool first coat of finish when dry, using No. 2 steel wool on electric steel-wooling machine, such as Hillyard's Steeltonian or Hiltonian Scrubbing Machine with steel wool pads. After thorough sweeping, final coat shall be applied evenly without laps. Temperature of the floor and room shall be not less than 70 degrees.

**Note:**—A diagram of official gymnasium markings will be furnished free on request.

## CEMENT

Onex Seal immediately and effectively checks cement dusting. It seals the open pores of the cement and forms a smooth wearing resistant surface which is easy to clean and maintain. Onex Seal seals the cement against moisture, dirt and stains.

(1) Scrub cement with Shine-All according to directions. Rinse floor with clear water and allow to thoroughly dry. Apply first coat of Onex Seal in thin even coat, covering approximately 200 square feet at a time. Onex Seal shall be applied with sheepskin applicator. Rub Onex Seal into the floor, applying evenly. Proceed with other sections until entire surface has been covered. Apply second coat same manner as above, then buff with the polishing machine such as the Hiltonian Lowboy. Temperature of room shall be not under 70 degrees.

## COMPOSITION FLOORS

Onex Seal will intensify the colors in magnesite and similar flooring, thoroughly sealing the installation, preventing penetration of moisture and disintegrating cleaning solutions, and provides smooth polished wax free surface.

(1) **First Coat**—After the area is thoroughly scrubbed with a neutral cleaning solution, such as Hillyard's Shine-All, apply a generous coat of Onex Seal, covering approximately a 200 sq. ft. area at a time.

(2) **Second Coat**—After first coat is thoroughly dry, apply second coat of Onex Seal same as in (1). After second coat has set, surface may be buffed to a deep mirrored polish. Temperature of room during application of Onex Seal shall not be less than 70 degrees.

### ASPHALT TILE

(1) Immediately after Asphalt Tile floor has been laid, and prior to any traffic, all excess asphalt cement shall be removed and floor swept clean. A solution consisting of equal parts of warm water and Shine-All Neutral Cleaner shall then be spread on floor and allowed to dry.

(2) Just before occupancy of building, floor shall be scrubbed with a solution of 7 parts of warm water and 1 part Shine-All. Then rinse thoroughly with clear water.

(3) **Two Coats**—Hillyard's Hil-Brite Liquid Wax shall be applied according to directions as furnished by Hillyard's.

(4) If wax finish is not desired, apply evenly on clean, dry floor after operation (2), a solution of 40% Shine-All and 60% water, and allow to dry. Then buff with electric polishing machine.

### RUBBER TILE

(1) Immediately after completion of floor, thoroughly clean with Shine-All Neutral Cleaner (1 part Shine-All to 7 parts warm water). Then rinse and allow to dry.

(2) **Two Coats**—Hillyard's Hil-Brite Liquid Wax shall be applied to clean, dry floor according to directions.

### QUARRY TILE

#### PROTECTING AND SEALING

(1) Just before final inspection, Quarry Tile Floor shall be thoroughly cleaned with steel wool, using a solution consisting of 1 part Shine-All Neutral Chemical Cleaner to 7 parts of warm water.

(2) After floor becomes thoroughly dry, a two-coat treatment of Hillyard's Onex Seal Finish shall be applied, strictly according to directions as furnished by the manufacturer, Hillyard's.

### CERAMIC, FAIENCE AND VITREOUS TILE CLEANING AND POLISHING

(1) Just prior to final inspection, all ceramic, faience and vitreous tile areas shall be cleaned by scrubbing with a solution consisting of 1 part Shine-All Neutral Chemical Cleaner and 7 parts water. (This solution for first cleaning only.) Do not rinse after scrubbing. When floor becomes thoroughly dry, buff with electric polishing machine.

### MODERN FLOOR MACHINES



22 Inch—19 Inch—16 Inch



Steeltonian

**HILSONIAN.** The Hilsonian Combination Scrubbing, Polishing, Waxing machines. . . . Three models. . . . The sturdy 22" Master Lowboy. . . . The 19" all-purpose Lowboy. . . . The 16" handy Lowboy. . . . Coordinating speed, power and weight. . . . Two interlocking, interchangeable brushes, which eliminates streaking. . . . Timken bearings. . . . Underslung lines permit passing under desks. . . . Durable non-corrosive alloy construction. . . . Cuts time and labor in scrubbing, polishing and buffing.

### TERRAZZO

#### NEW TERRAZZO CURING

A terrazzo floor properly installed requires slow curing.

Terrazzine—by sealing the moisture into the floor—retards the curing process from 10 to 15 days, thus insuring uniform and thorough hardening.

Terrazzine prevents pitting, dusting and checking, brings out the rich colors in the floor, seals against stains, produces a brilliant non-slippery finish when polished.

#### NEW TERRAZZO TREATMENT

(1) **One Coat**—Within 48 hours after the Terrazzo has been "rough stoned," apply a liberal coating of Terrazzine according to directions furnished by the manufacturer, Hillyard Sales Company, St. Joseph, Mo.

This treatment shall be allowed to remain on the floor for at least 15 days and until other trades have completed their work. The surplus Terrazzine shall then be removed by "fine stoning" the floor until a smooth, finished surface is produced.

All grinding dust and dirt shall be removed by the contractor through washing with Shine-All.

**Note:**—In no case shall harsh abrasives or caustic soap powder be used in cleaning terrazzo.

#### OLD TERRAZZO

Onex Seal effectively seals Old Terrazzo against penetration of moisture, checks dusting, pitting and checking, and produces a lustrous, wear-resisting surface which is easy to maintain in an attractive condition. Onex Seal brightens and preserves the natural colors of Old Terrazzo.

#### SEALING OLD TERRAZZO

(1) Floors shall be thoroughly scrubbed with a neutral cleaner such as Hillyard's Shine-All, then rinsed.

(2) **First Coat**—After floor is thoroughly cleaned, and all spots and stains are removed, apply the first coat of Onex Seal, spreading it evenly with a Sheepskin Applicator, treating approximately a 200 square foot section at a time.

(3) **Second Coat**—When first coat of Onex Seal has been absorbed and the surface becomes dry, apply a second coat of Onex Seal, spreading it in a thin even coat, treating approximately a 200 sq. ft. section at a time. Temperature of the room shall not be under 70 degrees.

(4) That excess portion of Onex Seal which remains on the surface should be buffed to a deep mirrored sheen with an electrically driven polishing machine, such as Hillyard's Hilsonian Lowboy.

**STEELTONIAN** is an economical machine to dry-clean wood floors, as it leaves a non-porous, non-slippery, easy to maintain, impervious to dirt surface. It is economical to operate, as rolled steel wool can be used on it.

**HI-KO DISINFECTANT:** A strong, clear, colorless, stabilized liquid germicide, fungicide and disinfectant. Splendid for combating Athlete's Foot and general use in the sanitation program.



Foot Bath Tray

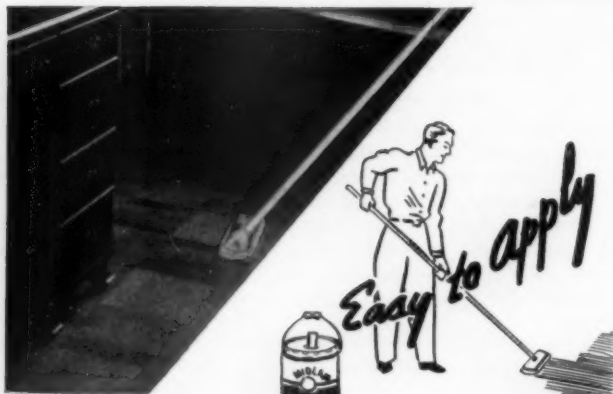
**FREE ON REQUEST, FOUR VALUABLE HELPS:** (1) NEW MODERN MAINTENANCE; (2) ARCHITECTS' SPECIFICATIONS; (3) MODERN FLOORS, THEIR MAINTENANCE; (4) BASKETBALL CHART AND SCORE BOOK



## MIDLAND LABORATORIES

Dubuque, Iowa, U. S. A.

*"Everything for Better Floor Maintenance"*



### GYMLOH

#### Special Gymnasium Floor Finish

GYMLOH is not an all-purpose finish; it is specifically designed as a gymnasium floor finish only. GYMLOH is easily applied, non-slippery, will not rubber burn, and is resistant to dilute acids and alcohol. And above all, IT'S TOUGH!



### EV-R-GLO

#### Self-Polishing Liquid Wax

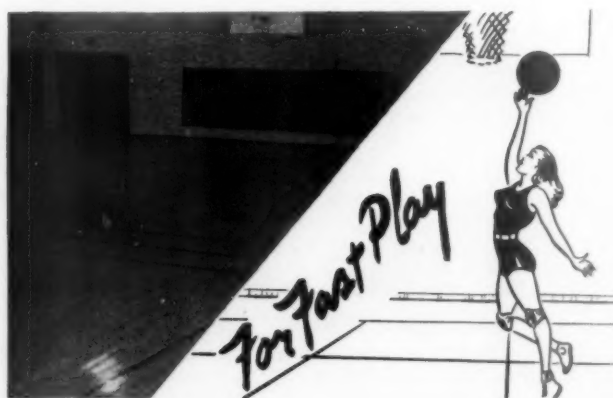
EV-R-GLO self-polishing liquid wax, easy to apply, quick to dry, water resistant and relatively non-slippery. . . . EVERYTHING YOU DEMAND IN A WAX. EV-R-GLO was developed not only to protect floor finishes from heavy traffic, but to add a lustrous beauty as well.

THE AMERICAN SCHOOL AND UNIVERSITY—1944

### LOHSEAL

#### Penetrating Wood Seal

For the cellular reinforcement of wood floors. A deep-sealing, hard-drying phenolic resin seal with an exceptional resistance to wear. The logical foundation for EV-R-GLO Wax or GYMLOH Gym Finish. Quickly and easily applied.



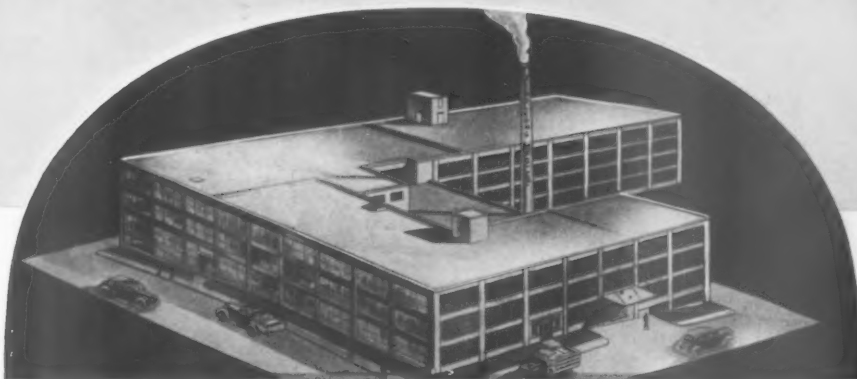
### SOIL-SOLV

#### All-Purpose Floor Cleaner

A quicker-cleaning, faster-rinsing liquid cleaner that may be used with safety and economy on all types of floors, walls, and woodwork. SOIL-SOLV combines the best qualities of a liquid soap with a synthetic dirt emulsifier and wetting agent.



# J. I. HOLCOMB MFG. COMPANY.

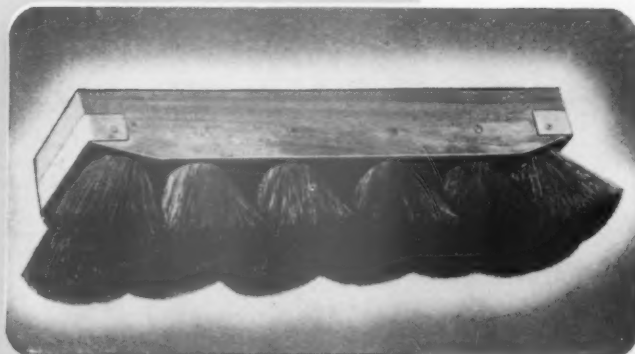
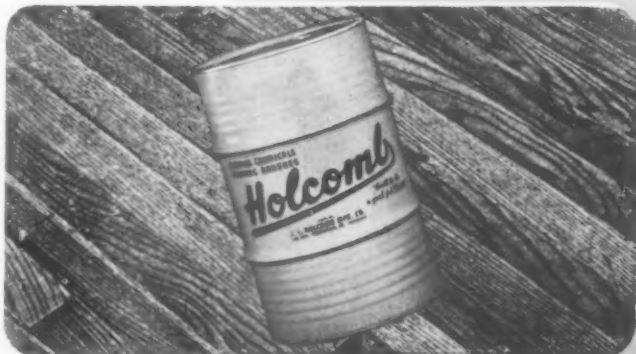


## USE CLEANING TOOLS and CLEANING CHEMICALS BUILT TO WORK TOGETHER!

For nearly half a century we have studied cleaning tools and cleaning chemicals. You can learn much about them, and the problems they must solve, in that time. Special tools and chemicals built to do specific jobs—built to the specifications of the men who use them—built to work *together* . . . help solve your manpower problem by doing a *good* job **FASTER**. Invest in tools built to work together . . . you'll have a cleaner institution at a lower *labor time* cost.

1896

1944



VITALIZED CLEANING COMPOUND—*and*—THE No. 66 SCRUBBER . . . .

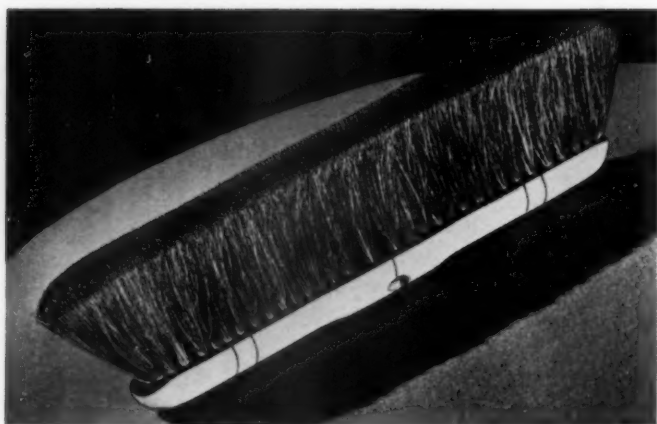


WATER PROOF WAX . . . . . —*and*— THE JUMBO DUSTLESS SWEEPER

Holcomb tools work faster . . . clean more thoroughly the first time over . . . make money by cutting maintenance time. If your Holcomb tool saves only one hour of cleaning time each day, that is a new profit of \$182.50 a year . . . on each man (at 50c an hour).

© 1944. J.I.H.Mfg.Co.

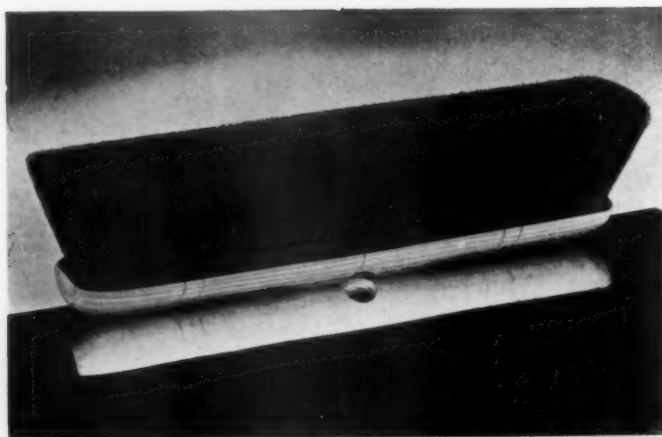
**J.I. HOLCOMB MFG. CO.** *"Cleaning Headquarters"* **INDIANAPOLIS-NEW YORK**



## for Sweeping Smooth and Medium Floors

### ... The "BOMBER"

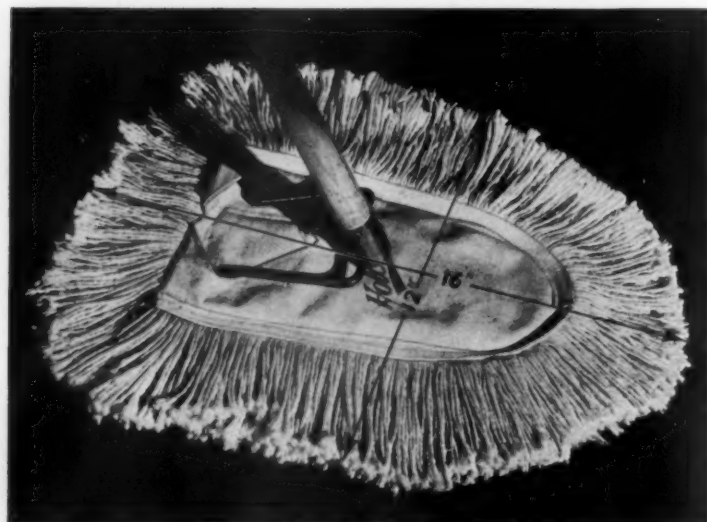
The scientifically mixed center stock of tested fiber and horsehair is a one-stroke dirt mover. Working together, this center stock kicks the dirt ahead and the outer casing of stiff grey horsehair keeps it and the fine dirt moving. Stock  $3\frac{3}{8}$ " out of block. 12-14-16-18-24 inch blocks, handles included. **Pitch Set.**



## for Sweeping Smooth and Medium Floors

### ... The "RACER"

Stock center is hair and fiber—outer casing is all snappy, selected hair for keeping fine dirt ahead of the brush. Each hair **sweeps** because full stock keeps it working with the end only. Stock  $3\frac{1}{8}$ " out of block. 14-16-18-24 inch blocks, handles included. **Machine Set.**



## for Dusting Hard-to-get-at Places FAST!

### ... The No. 340 DUSTER

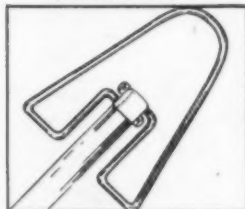
At any angle you hold the Holcomb 340 for dusting woodwork, floors, door casings, walls or ceilings—the face is always **flat** on the surface. Covers and cleans **more** surface, **faster**. Chemically treated soft cotton strands sewn on heavy canvas—slips easily on sturdy frame. Easily laundered and re-treated with Nu-Finish.

No. 340—Mop frame and head complete

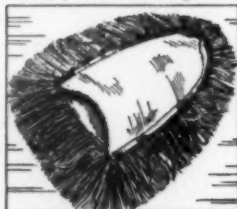
No. 341—Mop head only

No. 342—Two 341 heads on double frame complete

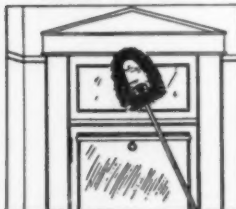
Substantial self adjusting metal frame.



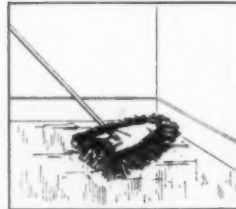
Soft spun cotton sewn on heavy pocket canvas glove.



Walls and ceilings readily reached and cleaned.



Shaped to clean corners quickly.



Cleans the "hard-to-get-at" places.



J. I. HOLCOMB MFG. CO.

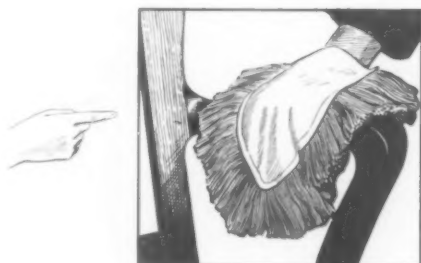
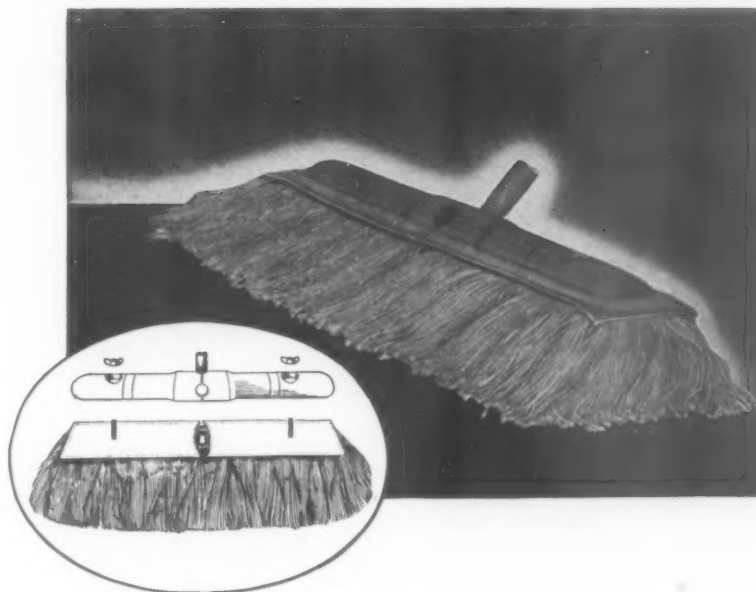
"Cleaning Headquarters"

INDIANAPOLIS-NEW YORK



# The *Holcomb* JUMBO DUSTLESS SWEEPER

IT'S SANITARY . . . IT'S QUIET . . . IT'S ECONOMICAL  
Germ Free . . . Does Not Disturb Classes . . . A Speedy Worker



**The No. 341 Used  
as a  
MITTEN  
DUSTER**

. . . makes for fast, efficient dusting . . . the chemically treated yarn picks up and holds more dust. Canvas back protects hands. A "swipe" and it's dusted.

Re-treat  
with Holcomb  
**NU-FINISH**

## **SWEEPS « DUSTS « POLISHES . . . in ONE Wide, Fast Stroke!**

Cleans, dusts, polishes—QUIETLY—and its chemically treated yarn *holds* the dust and dirt until shaken out. Heads of long, staple cotton sewn on heavy fabric are removable, interchangeable and easily laundered. Can be re-treated with Nu-Finish after washing. It SPEEDS cleaning!

### **Complete Block and Handle with Heads**

### **Heads Only**

No. 412 — 12" block  
No. 414 — 14" block  
No. 418 — 18" block  
No. 424 — 24" block  
No. 436 — 36" block  
No. 442 — 42" block

No. 413 — 22" yarn spread  
No. 415 — 24" yarn spread  
No. 419 — 28" yarn spread  
No. 425 — 34" yarn spread  
No. 437 — 46" yarn spread  
No. 443 — 52" yarn spread

**J.I. HOLCOMB MFG. CO.** *"Cleaning Headquarters"* **INDIANAPOLIS-NEW YORK**

*Holcomb*

LIQUID

"for more BEAUTIFUL FLOORS"

# WATER-PROOF WAX IS WATERPROOF!

Not Merely Water Resistant



Make This  
Water Test  
Yourself!

## Holcomb Water-Proof Wax Lasts Longer, Patches Perfectly

Water was dropped on each of the six dry spots of wax on this test glass. **No. 1 is Holcomb Water-Proof Wax.** After standing for a few minutes, 5 of the wax spots had emulsified. When wiped off with one hard stroke (as shown by the streaks on the glass), wax came off 5 of the spots. The grey spot on Wax No. 1 (caused by the hardness of the water used) disappeared in about 10 minutes. Holcomb Wax can be **wet mopped**. It is clear, brilliant and protects your floors **LONGER**. It cuts

down number of waxings in a year and, in addition, it **patches perfectly in traffic lanes**. It is **TOUGH—ELASTIC** and does **NOT CHIP**.

Use Holcomb WATER-PROOF WAX to coat your floor and keep it immaculate and glistening with the Holcomb JUMBO DUSTLESS floor sweeper which sweeps—dusts and polishes in a once-over stroke. Cut maintenance time in two with Water-Proof Wax and a JUMBO on the job.

In 55 - 30 - 15 - 5 gal. Drums

## HY-SHEEN LIQUID WAX

### DRIES BRIGHT WITHOUT POLISHING

Hy-Sheen is one of the most easily applied of all waxes—and it dries in 20 to 30 minutes. It dries bright without polishing. Can be buffed to a high gloss, and patches easily in traffic lanes. **Economical**. One gallon covers 1500 to 2500 sq. ft.

Non-Inflammable — No Oil Content

In 55, 30, 15, 5 Gallon Drums

*for . . .*

- Composition Floors
- Rubber Floors
- Linoleum Floors
- Hardwood Floors
- Terrazzo Floors
- Marble Floors

J.I. HOLCOMB MFG. CO.

*"Cleaning  
Headquarters"*

INDIANAPOLIS-NEW YORK

# *Holcomb* PURITINE

## The 3 INGREDIENT CLEANING COMPOUND

- ① **Dirt and Grease Solvent**
- ② **Free Rinsing Agent**
- ③ **Water Softener**

No matter where you clean with water—use PURITINE. It is universal in its uses—floors, walls, woodwork, painted or varnished surfaces, in the laundry, the kitchen. It will harm no surface . . . is free rinsing, leaves no soapy film and cleans FAST with little washing. It acts fast on the heaviest grease and dirt, costs only a penny a pail and goes 3 times as far as ordinary cleansing compounds.

In 325 lb. Bbls., 150 lb. Half Bbls., 60 and 30 lb. Drums



**PURITINE** 100% ACTIVE  
100% SOLUBLE

**Makes YOU Money by Cleaning  
FASTER and EASIER and by Going 3  
Times as Far as an Ordinary Cleaner**

## VITA- PINE

**Ideal For Removing  
RUBBER "BURNS"!**

Vita-Pine cleanses all floors, woodwork, painted walls, furniture or any washable surface SPEEDILY and leaves a refreshing pine odor. It takes only ONE-HALF pint to a bucket of water to do the normal job. As a neutral cleansing and deodorizing agent, it is tops.

In 55 - 30 - 15 - 5 gal. Drums

## VITALIZED (LIQUID) CLEANING COMPOUND

### for Floors... Walls... Woodwork

One of the most noted of Holcomb products. It is made of the finest vegetable oils and is especially for washing FLOORS, WALLS AND WOODWORK. V.C.C. penetrates and floats off dirt and grease without injury to any surface. It practically eliminates scrubbing—cleans walls for ONE-FOURTH the cost of a paint job; works FAST and can be used wherever water is used for cleaning.

In 55 - 30 - 15 - 5 gal. Drums



**J.I. HOLCOMB MFG. CO.** *"Cleaning Headquarters"* **INDIANAPOLIS-NEW YORK**





A "one-armed" man, with Holcomb Window Cleaner, can clean a window as fast as a two-armed man with the ordinary window cleaners.



for Windows . . .  
Glass Cabinets, etc.

*Holcomb*

## WINDOW CLEANER

SPRAY IT ON—WIPE IT OFF—and you have a sparkling, brilliant glass surface—no film and you've done the job in half the usual time. Here is a Holcomb product that is helping to relieve the manpower shortage in building maintenance everywhere.

1 gal. bottles and cartons of  
4 1-gal. bottles

## Holcomb WHITE STREAK *Quick-as-a-Flash!*



for BATHTUBS, URINALS, WASHBOWLS, SINKS, ETC.  
. . . of Porcelain, Tile, Enamel, or Granite . . . IT'S FAST

Another time and labor saving cleanser is "quick-as-a-flash" WHITE STREAK. One swipe and the dirt's off. Especially good for rest room fixtures and college

and school utensils of enamel, granite, etc. White Streak cleans so thoroughly (on tile walls, for example) that things stay clean longer.

275 lb. Bbls., 80 lb. Kegs, 25 lb. Drums  
(Cartons of 6 1-lb. Shaker Cans)

## The No. 15 MOP

. . . IT HOLDS MORE WATER

The Holcomb No. 15 Mop is the result of years of experience and experimentation. IT HOLDS MORE WATER! That means fewer trips to the mop bucket. It is a strong, most absorbent, "lintless" mop. The long, strong, absorbent strands have no linters to pull out. It mops more floor surface per trip to the bucket and—it picks up more water per trip from floor to bucket. This means *faster* mopping with less labor and that means lower mopping cost per classroom!

### No. 15 MOP HEADS

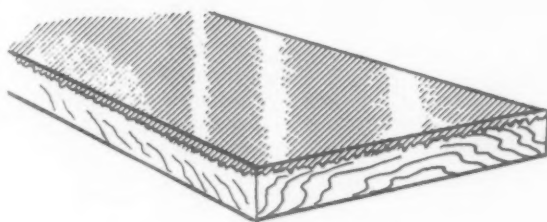
16 oz. heads, 6½ x 17"  
20 oz. heads, 6½ x 17"

24 oz. heads, 7 x 19"  
32 oz. heads, 7 x 21"



**J. I. HOLCOMB MFG. CO.** *"Cleaning Headquarters"* **INDIANAPOLIS-NEW YORK**

# SEAL-COAT ... *The Perfect SEAL for Wood Floors*



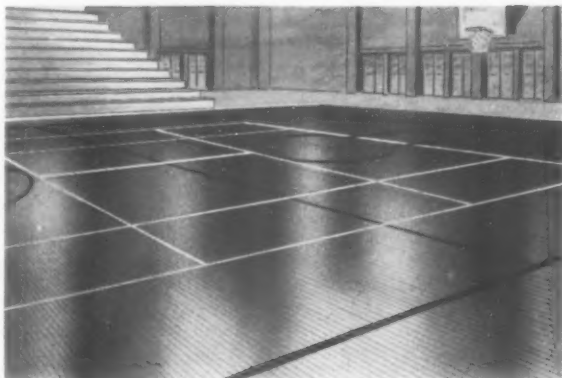
**IT PENETRATES!**

**You Must Wear Off the Wood  
to Wear Off the SEAL-COAT**

Seal your wood floors, whether new or old, with Holcomb Seal Coat. It **PENETRATES!** It brings out the natural color and grain of the wood and protects the surface. Seal Coat, in penetrating, combines with the wood to form a new, protective **tread**. It is more easily swept because the grain of the wood is filled. That speeds the sweeping job. Your floor may be waxed also. Using Holcomb Water-Proof Wax on a sealed floor gives it greater beauty, makes it more durable and makes for less maintenance cost.

**In 55 - 30 - 15 - 5 gal. Drums**

## Holcomb GYM FINISH *IT'S MADE TO "TAKE" IT!*



One of the most **enduring**, mirror-like gym finishes. It takes untold abuse without injury to the appearance of your floor. It covers 600 to 800 sq. ft. per gallon . . . and gives you—

- a **Natural Color Floor**
- a **Mirror-like Finish**
- a **Slip-preventive Surface**
- a **Non-Rubber-Burning Coating**
- a **Floor Easily and Economically Maintained**

**In 55, 30, 15, 5 Gallon Drums**

[ **VITA-PINE . . . Ideal for Removing Rubber "Burns" from Gym Floors.**

## **PINE-OLA Disinfectant and Deodorant**

Why bother with two, three or four different solutions for disinfecting and deodorizing when all-purpose Pine-Ola

will do the whole job? From rest room to garbage cans, it's **the** ALL purpose, money saving solution.

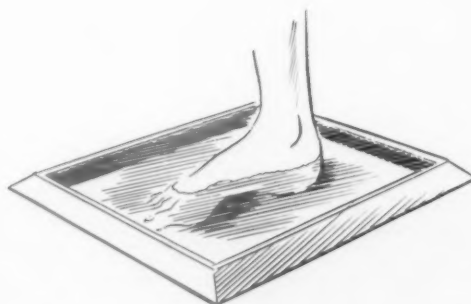
**In 55, 30, 15, 5 Gallon Drums**

## Holcomb **FOOT-BATH FUNGICIDE**

**...A Preventive Against Spread of "Athletes Foot"**

"FUNGICIDE" is a liquid concentrate, the diluted solution of which **KILLS** the fungus causing "Athlete's Foot". It does not bleach, stain or irritate. Use it in foot baths in shower rooms, locker rooms, gymnasiums, swimming pool rooms. Can be sprayed or mopped for a disinfectant. Dilution: 1 part to 100 parts of water. **Non-corrosive.**

**In 55, 30, 15, 5 Gallon Drums**



**J.I. HOLCOMB MFG. CO.** *"Cleaning Headquarters"* **INDIANAPOLIS-NEW YORK**



## *Holcomb* SPECIAL ITEMS

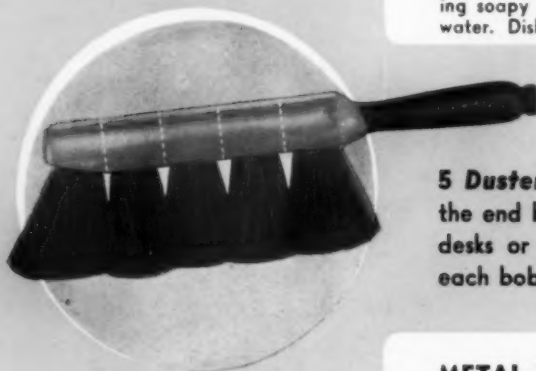
### FLOOR TREAT SPRAY IT ON— SWEEP IT OFF!

**MAINTAINS WOOD FLOORS FOR LESS!**

For treating unsealed wood floors and in maintaining varnished wood; Linoleum, Rubber, Composition, Tile, Terrazzo, etc., and waxed or unwaxed surfaces of wood or steel. Restores natural finish and builds up a glossy surface. Your floors sweep **FASTER!**

### DISHWASHING COMPOUND

For *machine* dish washing **ONLY!** It's **FAST** . . . and free rinsing without leaving soapy film. No scale in machine. Economical, one-half oz. per gallon of water. Dishes and glassware remain free of deposits and water marks.



### No. 16 BENCH DUSTER

**5 Dusters in ONE!** Saw yourself a "new" bench duster when the end bob wears down. The No. 16 cleans benches, chalk rails, desks or **ANYTHING, FAST!** "Bob" constructed for strength, each bob an individual unit.

### METAL LUSTER . . . *Liquid Metal Polish*

Cleans and polishes **ALL** metal surfaces with little or no rubbing. Brass, Copper, Stainless Steel, Bronze, Nickel. Merely apply—wipe off with **clean** soft cloth. It's **SPEEDY!**



### No. 6 TOILET BRUSH

This famous Holcomb tool has the stiff wings that get the scum under the rim. Straight handle for an all around the bowl stroke without changing grip. A clean bowl is odorless.

#### Use It with "BOWL CLEANER"

Regular use of Holcomb Bowl Cleaner keeps toilets free from discoloration, scum and lime. The No. 6 and Bowl Cleaner make a perfect Holcomb team.



### STOP-GO . . . *Keeps the plumber out of your DRAINS!*

Stop-Go dissolves or loosens foreign matter which clogs drains, grease traps, toilets, wash stands, shower drains, etc. One can dissolved in 2 qts. of boiling water opens a stopped drain in 2 to 10 minutes.

### FRESHETTES . . . *Rest Room Deodorant*

They are for **ONE** purpose only. Holcomb FRESHETTES *replace* objectionable odors in lavatories and urinals with a pleasant fragrance. Insoluble in water. 6 to a can. Cartons of 4 and 12 cans.

### "INSEKIL" . . . *for FLIES - BUGS - ROACHES*

It's for Flies, Moths, Mosquitoes, Ants, Roaches, Bedbugs, Water Bugs, Spiders, Centipedes. Knocked down **100%** of flies in 10 minutes (Peat-Grady Test).

**J. I. HOLCOMB MFG. CO.**

*"Cleaning  
Headquarters"*

**INDIANAPOLIS-NEW YORK**



# LINCOLN-SCHLUETER FLOOR-MACHINERY COMPANY, INC.

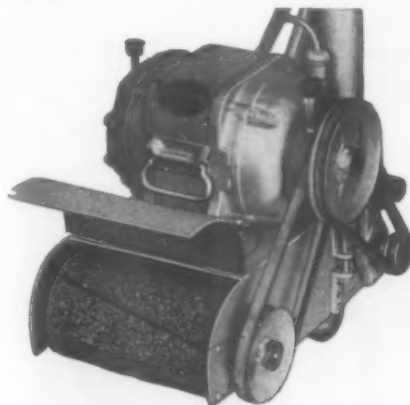
Manufacturers

540 S. Peoria Street, Chicago 7, Ill.

Phone: MONroe 5732



Floor maintenance equipment shown on this page represents but a few of the models which have made Lincoln products so favorably known to school and university managers for nearly half a century. We are again permitted to manufacture floor machines, but their sale must be authorized by the War Production Board on form WPB 1319. There is no restriction whatsoever on repairs, replacement parts, supplies, sandpaper, etc. Your needs along this line will receive prompt attention. New streamlined Lincoln models that defy comparison will be yours, postwar.



## 3 MACHINES FOR PRICE OF ONE!

LINCOLN-SCHLUETER  
MULTI-PURPOSE

Sands — Steel-Wools —  
Waxes and Polishes

Especially valuable for a variety of floors of different materials and of different age and condition. Sands old, warped, worn wood floors to reveal the hidden surface of smooth new wood. STEEL-WOOLS to remove accumulated oil, seal and grime, and to aid distribution and penetration when new seal is applied. WAXES and POLISHES wood, linoleum, tile, composition, concrete and terrazzo floors in your halls, classrooms, gym, auditorium and laboratories. Takes but a few minutes' time to change drums.

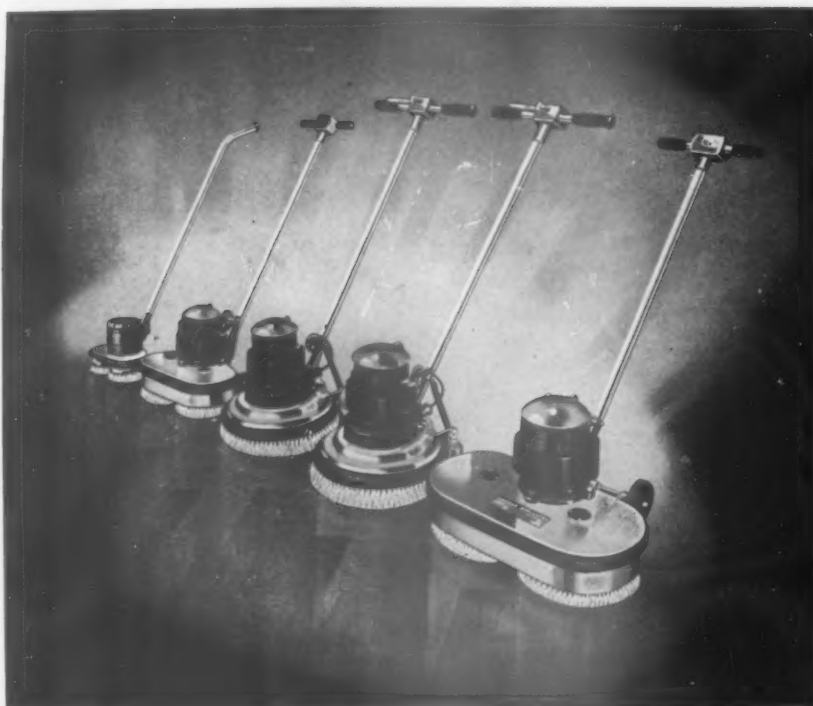


For Table and Desk Tops—Stairs—Trim  
—Sills—Panels—Manual Training

Weights  
but  
16½ Lbs.

SERVICE—Repairs and replacement parts available now. New streamlined models, better than ever, will be available postwar. Representatives in all principal cities. Write!

THE AMERICAN SCHOOL AND UNIVERSITY—1944



No. 11 No. 16 No. 15 No. 18 No. 20

## The Lincoln Line of FLOOR SCRUBBING and POLISHING Equipment

No. 11. Small office or school model, with two brushes covering a floor span of 11 inches. Like all Lincoln models pictured above, you can use it for scrubbing, waxing and polishing floors of wood, linoleum, tile, concrete, etc. Even a child can operate it.

No. 16. Especially designed for efficient, fast and economical scrubbing and polishing in medium-size schools and institutions. All Lincoln polishing machines come fully equipped with interchangeable scrubbing and polishing brushes. The floor span of this machine is 16 inches.

No. 15. The Lincoln Single Disc "Sphinx" Silent Polisher and Scrubber. Full weight of the motor directly over brush. Perfectly balanced for easy operation. Equipped with safety switch. Brush covers in excess of 15" floor span and works right up to baseboard.

No. 18. This heavy duty single disc "Sphinx" Silent Polisher and Scrubber has a floor span of 18" and is ideal for large areas. Has an automatic safety switch, extra length guide handle and life time lubrication. May be equipped with tank and automatic water feed if desired.

Heavy Duty Twin Disc model . . . the world's fastest and most efficient polishing and scrubbing machine. Has 21" brush span. The twin brushes revolve in opposite directions eliminating all side pull or whip—thus even with its size this machine is guided without effort.

## NEW PORTABLE DUSTLESS DISC SANDER

Desk and blackboard sanding or refinishing is easy for your janitor or handy man with this streamlined portable sander. Doubles as manual arts shop equipment, sands furniture, millwork, desk and table tops, trim, stair treads, panels, etc. LEAVES NO DUST. Powerful suction captures all sand, grit and wood particles and "bags" them for disposal. Equipped with headlight for work in dark corners. Flexible 7" sanding disc conforms readily to uneven surfaces.



# THE KENT COMPANY, INC.

174 Canal Street, Rome, N. Y.

## BRANCH OFFICES

New York

Philadelphia

Washington, D. C.

Hartford, Conn.

Los Angeles, Calif.

## KENT ELECTRIC FLOOR MACHINES

*Scrubbers — Suctions*



### KENT-KEPT

WELL-SCRUBBED  
QUICKLY DRIED  
SCHOOL FLOORS  
LAST LONGER!

**SPEED** — KENT fast-cleaning machines raise standards and lower costs.

**POWER** — Thorough cleaning is done easily and tirelessly with KENT electric machines.

**SAFETY** — Safe working conditions require safe, adequate cleaning tools.

*Write for Circulars*



*This is the QUIET KENT Model C15 ELECTRIC FLOOR MACHINE — for scrubbing*

It also performs with ease, speed and efficiency the tasks of polishing, buffing, sanding and steel-wooling



*This is a KENT ELECTRIC DRY SUCTION — for vacuum-cleaning*

Powerful suction, long reach and a great variety of uses, are noteworthy advantages of this KENT tool



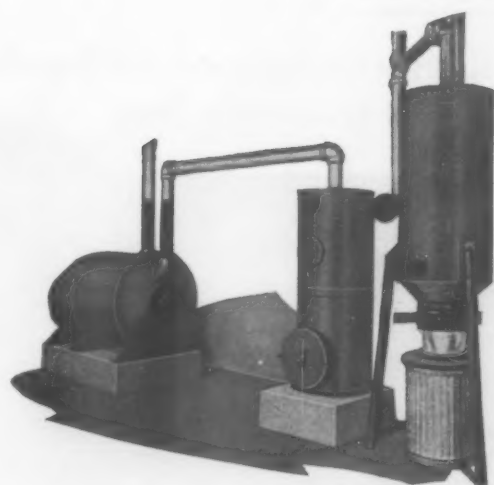
*This is a KENT ELECTRIC MOPPER — for water pick-up*

Hand labor and old-fashioned methods cannot compare with the speed, efficiency and economy of this modern electrical tool

THE AMERICAN SCHOOL AND UNIVERSITY—1944

# THE SPENCER TURBINE COMPANY

Hartford 6, Connecticut



## THE SPENCER CENTRAL VACUUM CLEANING SYSTEM

The Spencer Central Vacuum Cleaning System has met with the approval of architects and engineers everywhere, and has been installed in more than 10,000 buildings, including more than 1500 school buildings.

Spencer Central Vacuum Cleaning is a permanently installed system for the speedy and complete removal of dirt and dust from all kinds of floors, walls, ceilings, furniture and other building equipment. It consists of five essential parts, each carefully selected to meet the special requirements for each individual building:

1. A vacuum producer, located in the basement.
2. Inlet valves, conveniently located on all floors and piped to vacuum producer.
3. Specially designed, entirely enclosed, and easily cleaned separator.
4. Light weight, flexible hose.
5. Special vacuum tools for each operation.

**Advantages**—In exhaustive tests in leading schools, the powerful vacuum, scientifically applied with correct tools, has demonstrated its ability to remove more of the dirt in less time than other methods.

Because the equipment is simple in design, requiring little attention and because these systems are built to provide satisfactory service over long terms of years, both the operating and amortization costs are extremely low.

One janitor can clean twelve average sized class rooms in two hours with a 3 HP Spencer System. The Spencer elbow joint makes cleaning around furniture easy.

**For Cleaning Erasers and Chalk Trays**—Spencer Vacuum Cleaning, instead of scattering the great bulk of the chalk dust on the floor, provides a method of cleaning erasers and chalk trays that is rapid, sanitary, easy and thorough. The janitor has only to attach a special tool and move it across the surface of eraser or chalk tray.

**Swimming Pool Cleaning Equipment**—By means of special cleaning tools usually employed in connection with the pump on the filtering system, it is possible to remove accumulated sediment from swimming pools without the waste of water involved in draining the pool. Bulletin on request.

### In Boiler Rooms—

Spencer Vacuum keeps boilers working at top efficiency by cleaning soot out of boiler tubes, in this way often saving the cost of the entire installation within a few years. Spencer Vacuum also keeps boiler room floors clean, and easily removes soot and dust from overhead pipes.



## SPENCER PORTABLE VACUUM CLEANERS

The Spencer  $\frac{1}{3}$  HP Portable Vacuum Cleaner shown above weighs only 34 pounds. The  $\frac{3}{4}$  HP unit shown below weighs 150 pounds. Both are built on the same principles of design as the larger Spencer units, and use the same vacuum tools. Easy to clean, easy to use, and built for long life service.



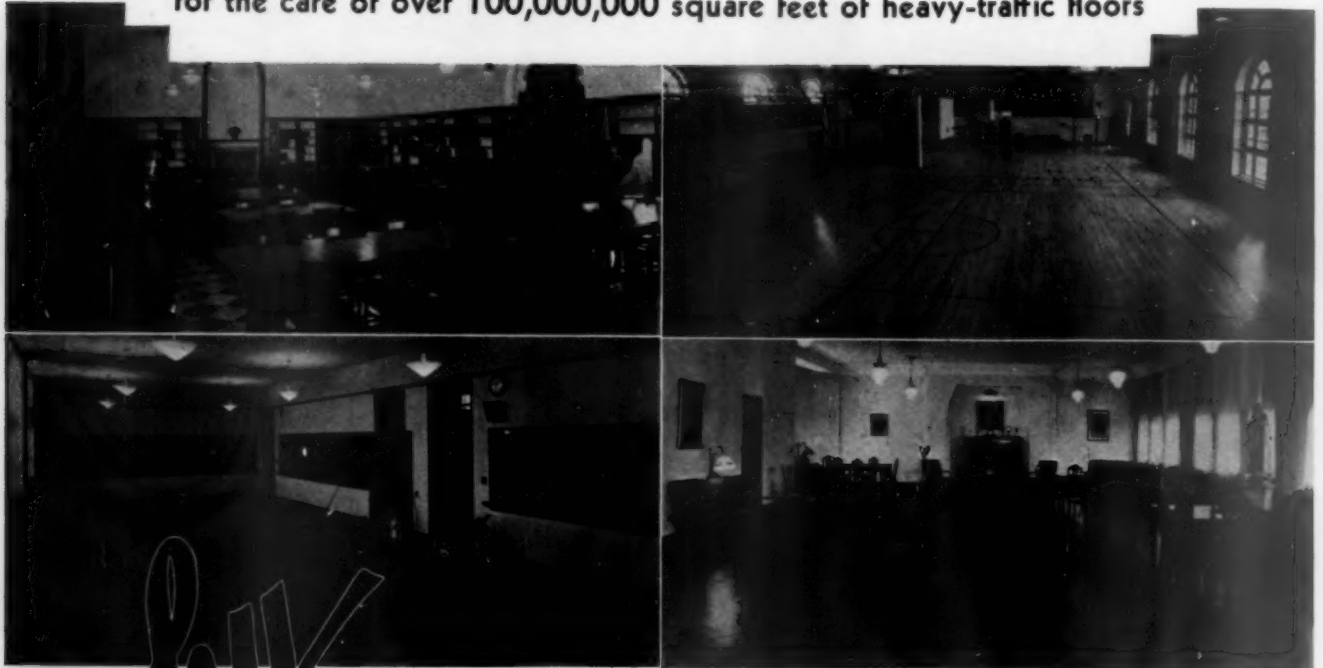


# G. H. TENNANT COMPANY

Established 1870

General Office and Factory: Minneapolis, Minn.

The TENNANT SYSTEM is today used throughout the United States and Canada for the care of over 100,000,000 square feet of heavy-traffic floors



*Why*

## this universal demand for THE TENNANT FLOOR MAINTENANCE SYSTEM?

- This modern method of dry cleaning wood floors keeps them smooth and hard surfaced. Thus, they will wear remarkably well and remain easy to sweep with a cotton mop.
- Tennant maintained floors reflect light and have a sanitary, homelike cleanliness. This is conducive to orderliness on the part of the students.
- Partial refinishing in traffic areas can be done without showing lap marks. Therefore, floors always retain a uniformly attractive appearance. Resanding and oiling are never required.
- Asphalt tile, linoleum and cork floors can be cared for equally well with the Tennant System.
- This easily operated maintenance program is both economical and efficient. Floors are improved in condition and appearance with continued use of the Tennant System. A demonstration of our process as applied to the care of your floors will convince you of its merit.
- Tennant floor maintenance equipment is practical. In addition to serving as a cleaning machine, it provides a speedy, systematic method of finishing new floors and reconditioning old floors.
- The Tennant floor machine operates flush with the wall, has a cylindrical drum that revolves at 800 r.p.m. for burnishing work and 1400 r.p.m. for sanding. This drum rotates in either direction.
- Wax application and polishing can be completed in one rapid operation. Other attachments convert the same machine into a sander, steel wool burnisher and scrubber. The attachments are easily changed without using tools.
- The Tennant machine is equipped with vacuum for collection of dirt, dust and steel wool fragments.
- Trained factory representatives will instruct your operators in proper use of Tennant equipment. They are experienced in all types of floor work and can assure you of the same fine results secured by other users of the Tennant System.

*The way to finer floors*

**TENNANT**

*Floor Maintenance System*

THE AMERICAN SCHOOL AND UNIVERSITY—1944

# WEST DISINFECTING COMPANY

42-16 West Street, Long Island City 1, New York

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AND PRINCIPAL CITIES IN CANADA

## WESTONE REMARKABLE NEW LABOR SAVING PRODUCT THAT SIMPLIFIES FLOOR MAINTENANCE



### WESTONE IS . . .

a chemical floor treatment in liquid form which penetrates and blends with the floor material to form a hard-wearing, water-proof surface which helps to prevent grit, sand or dirt from being ground into the floor by foot traffic. Westone is not a floor oil and will not become gummy or sticky. It penetrates rapidly and evenly and unlike many other floor treatments, actually becomes a part of the floor material itself.

### WESTONE PREVENTS FLOOR WEAR

because it brings a hard finish to a sealed wood floor which makes the seal permanent. It gives a tough protecting film to wood floors which makes the floor last much longer. To highly porous terrazzo, tile, composition and marble floors, Westone brings a positive binding action which helps prevent disintegration, erosion and decay.

### HOW WESTONE CONTROLS DUST

The presence of dust in room atmosphere is due not so much to open windows as it is to floor traffic. When traffic is continuous dust never settles on the floor so the problem is to keep the dust from rising. Westone has, in addition to its other properties, a peculiar affinity for dust and where it is properly used to maintain a floor, the atmosphere will be comparatively free from it because foot traffic will not cause the dust to rise.

### IMPROVES APPEARANCE

Different than most floor treatments which are put on a floor and then not applied again until their protective action has been outworn, Westone, if used as directed, will continuously improve the appearance upon each regular application.

### THE LOW COST

Two factors make Westone economical to use. Ease of application enables one person to do the work of three in maintaining floors and, because Westone is highly diffusive, a small amount gives enormous coverage. On a sealed floor, one gallon covers 4,000 square feet when first applied. These two factors actually make the cost of maintaining floors with Westone less than with the old soap and water method.

### NEW USE FOR WESTONE! CLEANS BLACKBOARDS

Wipe blackboard with cloth dampened with Westone. Wipe off excess with a clean dry cloth. Allow blackboard 12 hours to dry. Results will be amazing

WESTONE CAN BE USED ON CONCRETE OR ANY TYPE WOOD FLOOR

### Other West Products Designed To Reduce Maintenance Costs

- Liquid Soap and Dispensing Systems
- Disinfectants and Deodorants
- Insecticides and Raticides
- Paper Towels and Cabinets
- Kotex Vending Machines
- Cleansers • Floor Finishes

**WEST** DISINFECTING  
Company

Dept. BU, 42-16 West St., Long Island City 1, N. Y.

FREE Copy of this  
catalogue on request.



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# ALLAN J. COLEMAN

120 W. Illinois St., Chicago, Ill.

## COLEMAN'S SEWER and DRAIN CLEANING TOOLS



### FLAT STEEL SEWER RODS

And Tools for Opening All  
Stoppages

All Rods are made of a special prepared Oil Tempered Spring Steel Wire and are fully equipped with Spear Point, Handle and Roller Ball.

### FLEXIBLE COIL WIRE SEWER AND PIPE AUGERS

Made of the best Oil Tempered Spring Steel and are flexible, enabling them to turn bends and go through traps. Furnished with corkscrew and handle complete.

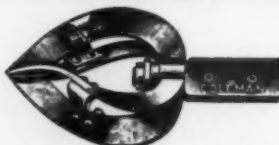


### FLEXIBLE REVOLVING SOLID ROLLER BALL HEAD FOR SEWER RODS



Equipped with 6 inch Flexible Spring Attachment which enables Rod to be rolled around any bend.

### GIANT REVOLVING SEWER CLEANING SPEAR POINTS AND ROOT CUTTERS FOR SEWER RODS



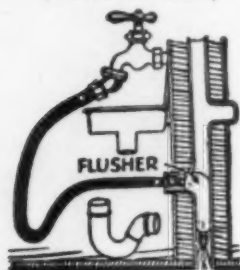
Points revolve by pushing in and out of pipe. Will drill a hole through most any stoppage.

### REVOLVING SOLID ROLLER BALL HEAD FOR SEWER RODS



This Ball Head is furnished with a solid shank to bolt onto Rods.

### HYDRAULIC FLUSHER (Water Pressure)



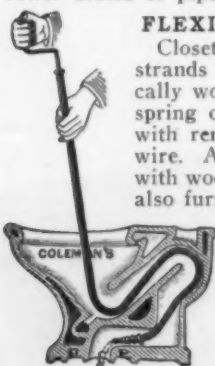
This Hydraulic Flusher is made of several plies of water-tight heavy rubberized fabric, which assures a strong, durable and flexible connection that is easy to insert into traps, vents, curved sewer drains or pipes.

**HEADQUARTERS** for all kinds of  
Flexible Sewer and Pipe Augers—Flat  
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Cleaners—Wood Conduit and Sewer  
Rods—Basin Dips—Brass Suction and  
Force Pump—Suction and Force Cups  
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can be purchased through your local

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### CAN ALSO FURNISH CABLES FOR SEWER MACHINE

**SEND FOR  
OUR CATALOG**



### FLEXIBLE CLOSET CLEANER

Closet Cleaners are made of 21 strands of high grade wire scientifically wound to form a solid flexible spring or shaft  $\frac{3}{8}$ " O.D. Equipped with removable corkscrew and cone wire. Assembled with polished tube with wood grip handle. Other grades also furnished.



### GAUGE GLASS CUTTER

Cadmium plated over all . . . with wood finished handle. Sizes made to cut from 8" to 30" lengths, inclusive.



Suction  
Pump

### SUCTION PUMP

Has suction of 50 lbs. and a force of 100 lbs. or more. Equipped with large reversible red rubber cup, with cast brass screw connections.

### FORCE CUP

Made of special grade large  $5\frac{1}{2}$ " Red Gum cup. Corrugations on bottom give perfect seal.



Force  
Cup

**"GUARD HEALTH" By Using COLEMAN'S Tools to Keep Sewer Drains Running Freely and Have Sanitary Buildings**

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# J. A. SEXAUER MANUFACTURING CO., INC.

Dept. S, 2503-2505 Third Avenue  
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**"SPECIALISTS IN PLUMBING AND HEATING MAINTENANCE MATERIALS FOR 23 YEARS"**  
Conserve Irreplaceable Fixtures; Save Water, Fuel, Critical Materials, Manpower with  
Patented 'Sexauer' Precision Tools and 'Sexauer' Triple-Wear Replacement  
Parts as Advertised in the Saturday Evening Post



**DON'T YANK OUT OLD, WORN, LEAKY FAUCETS**—Re-form their rough, scored washer-chewing seats with this "Sexauer" Pat'd Precision Tool which restores them better than new . . . even brings old, discarded faucets and valves back to long and useful service. This handy tool is in daily use by leading maintenance engineers everywhere.

**"STAY-PUT" REPAIRS**—Drips are a costly nuisance which not only waste water and fuel but destroy valuable fixtures. After re-forming faucet seats, install "Easy-Tite" Pat'd Washers. Fabric-reinforced like a tire, they resist absorption, withstand extreme hot water temperatures (upwards of 300° F.), won't split or mush out of shape. "Easy-Tites" outlasts half-a-dozen ordinary washers.



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**THE "SEXAUER SYSTEM" KIT**—skillful assembly of Precision Tools and 1326 Triple-Wear Replacement Parts, provides the exactly proper items for fast, one-trip repairs. Contains everything necessary for Faucet Renewal, Toilet Tank Repairs and General Repairs, together with frequently-needed accessory items. In widespread use by leading schools, colleges, hospitals, plants, etc.



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Turf Service for Schools

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Marysville, Ohio

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Grass growing presents many and intricate problems—most of which someone has solved.

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Scotts Seed is known the country over for its dependable quality. It has produced fine turf on more than 1600 golf courses and is the preference of scores of colleges, universities and high schools for their athletic and campus areas.

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**CAMPUS MIXTURE** available in top quality and also in a popular price quality.

**SPECIAL MIXTURES** for special places. Let us quote on any formula that you use.

**SEPARATE GRASSES.** As largest handlers of grass seed in U. S. we can quote attractive prices on good quality.

**TURF BUILDER** the special food for grass. You can have better turf and save money on seed by using this food.



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## THIS TURF BOOK FREE ON REQUEST "GOLF TURF"

A valuable reference book on the making and maintaining of Turf on Golf Courses, Polo Fields, Tennis Courts, Airports, etc.

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## GRASS SEED OF KNOWN QUALITY

FOR GOLF COURSES, TENNIS COURTS, POLO FIELDS, ATHLETIC FIELDS, AIRPORTS, CAMPUS, LAWNS, ETC.

All our seeds are of the highest quality, botanically true to name and are cleaned and re-cleaned, special care being given to the elimination of weed seeds.

We are always glad to advise in regard to formulas suited to soil and climatic conditions, treatment of soil, fertilizing, etc.

## EQUIPMENT AND SUPPLIES

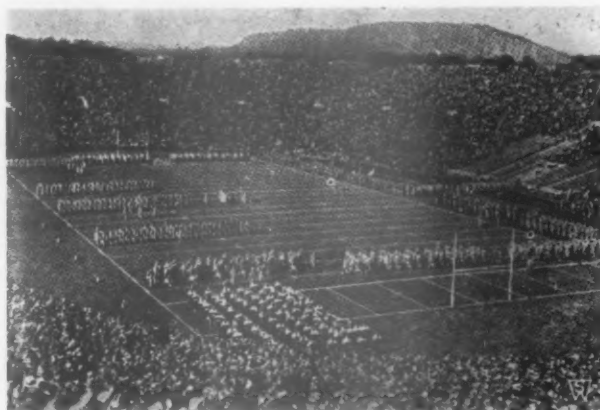
We are also agents and dealers in Tractors, Mowers, Rotary Soil Screens, Implements, Fertilizers, Insecticides and Sundry Equipment and Supplies.

Some of these items are unobtainable at the time this book goes to press, but we welcome your inquiries.

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Experimental Turf Plots at the Stumpp & Walter Company's testing grounds at Farmingdale, Long Island. Here research work has been carried out with grass varieties, plant foods, mowers and rollers



The Yale Bowl at New Haven, Conn. Grass Seed for Yale Bowl, as well as for Yale Golf Course, Polo Field and Football Field, also for Stadium at West Point, supplied by the Stumpp & Walter Co.

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We are one of the largest growers and importers of Bulbs for discriminating flower lovers in the United States.

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All our seeds are of the highest quality and are carefully examined and tested at our trial grounds. We offer only those of superior strains and finest types, and a complete list of new introductions.

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A complete Catalog of Seeds, Bulbs, Plants and Horticultural Supplies. It contains many pages of illustrations in natural colors.

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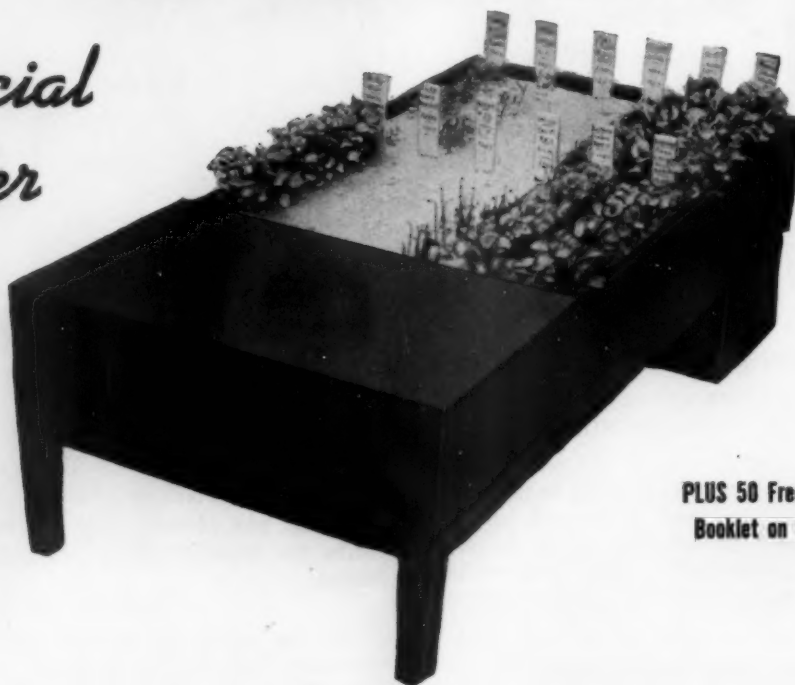
## COLDWELL LAWN MOWER COMPANY

America's Oldest Manufacturer of Lawn Mowers Since 1867  
Newburgh, N. Y.

# A SCIENTIFIC GARDEN FOR YOUR CLASS ROOM

## COLDWELL CHEMICAL CROPS SYSTEM

*Special  
Offer*



**PLUS 50 Free Copies of a Special  
Booklet on Chemical Gardening**

**H**ERE is an opportunity to study chemical gardening first hand, and stimulate interest in correlated subjects. This Coldwell Chemical Crops Unit is ideally suited for class room use, and will prove an absorbing project for pupils and teacher. The booklet which accompanies the unit was developed by one of America's leading scientists. It was especially prepared for class room use, and contains no advertising.

Students of all ages will be interested in the Unit from a Victory Garden standpoint. Set it up as a flower grower in the elementary grades to tie in with Nature Study. In the grammar grades, use it to stimulate interest in gardening and 4-H Club activity. In high school it is a gold mine for experimentation and demonstration in botany and chemistry classes.

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The Coldwell System is an adaptation of a method used by agricultural experimental stations at famous universities.

### HERE'S WHAT THE COLDWELL CHEMICAL CROPS SYSTEM INCLUDES:

1. Wooden seed bed—22 inches by 12 inches—reservoir and catch basin. Built to last for years.
2. Special, sterile sand properly mixed with mica.
3. Four packages of chemicals to make up the nutrient solution.
4. A chemical "thermometer" for testing the nutrient solution.
5. A complete and descriptive booklet on growing plants without soil.

Plus: Special school offer of 50 free copies of chemical gardening textbook for class room use.

# ECLIPSE LAWN MOWER COMPANY

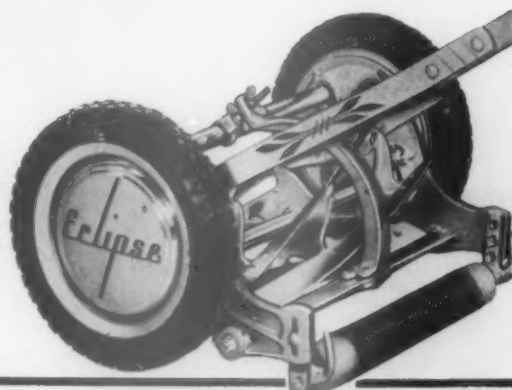
Factory and General Offices: Phophtetstown, Illinois

## Eclipse

AMERICA'S FINEST MOWER  
for  
SUPREME PERFORMANCE

Striking in appearance, with finest quality. Featuring valveless pneumatic tires, silent tapered bearings on rubber rollers, rubber handle grips, plus finger-tip adjustment and automatic sharpening. You can not match these features for economy in performance.

Illustrated — 5-blade, 16" .....



21"  
CUT

# Parkhound

Geared to present day  
mowing standards with  
that built-in staying quality

### SPECIFICATIONS

Full 21" cut. Cuts 2 to 4 acres a day. Briggs & Stratton 4-cycle 1 H. P. motor. Timken, Oilite Bronze and steel bearings. Positive oversize expansion-type clutch. Speed control to suit your pace. Goodyear tires—10½" x 2½". Ample traction for heavy-duty service. Sharpening device optional. Brings a new effortless motorized mowing to the commercial cutter.

# SPEEDWAY

5 TO 7  
MILES  
Per  
HOUR

SPEED—DOUBLED  
ACREAGE—DOUBLED  
ECONOMY—DOUBLED

Fastest Perfect Cutting Power Lawn  
Mower Ever Built.

The World's Largest Producers of  
Power Mowers.

You can count on ECLIPSE for lawn mowers  
of quality when production is resumed



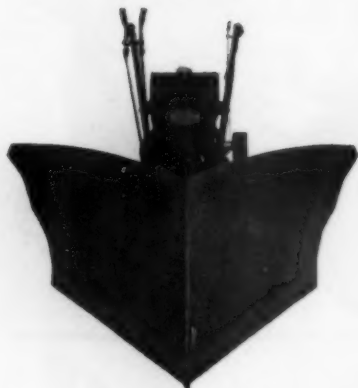
32"  
CUT

Imagine a 32"  
swath; 150 feet long  
every 15 seconds,  
actual stop watch  
time. Positive oper-  
ator control at these  
speeds and perfect  
cutting.

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# GRAVELY MANUFACTURING COMPANY

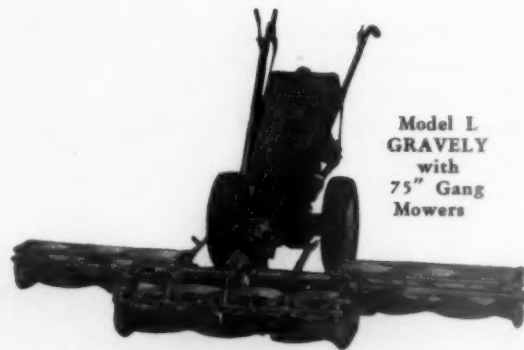
Box 252, Dunbar, W. Va.



Model L GRAVELY  
with  
Vee-Type Snow Plow

Schools and universities throughout the country recognize the distinct advantages of the GRAVELY—the **only** machine that solves so many upkeep problems.

1. Mows Your Lawn
2. Cuts Tall Weeds and Grass
3. Removes Snow



Model L  
GRAVELY  
with  
75" Gang  
Mowers

## A YEAR-ROUND MACHINE

You buy ONE sturdy 5 H.P. Tractor . . . then, change power attachments according to the job. With the GRAVELY one man does everything. . . .

A 30-inch Power Driven Rotary Mower for the lawns (power-driven gang units and riding sulky available for the larger areas) . . . a Power Sickle Mower for the rough spots and athletic fields. . . .

A power sprayer . . . A Power Pump . . . A cart for moving dirt . . . or odd jobs of hauling. . . .

Both Vee and a Patented Reversible Blade Type Snow Plow capable of working in 12" of snow.

Whatever the job, if you own a GRAVELY you have the equipment and sufficient power to do it.



## FRUITS OF SPECIALIZATION

The GRAVELY is produced in a factory devoted to manufacturing nothing else.

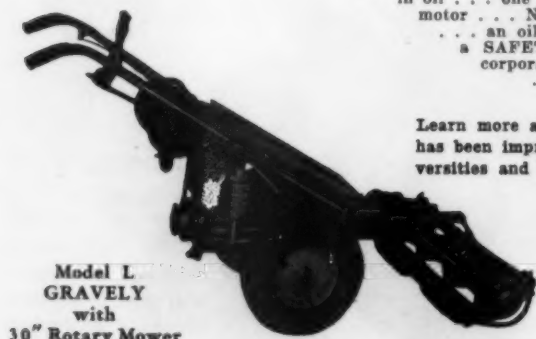
This includes making the motor as well. Each manufacturing operation is controlled. This means that each machine is produced as a complete unit, each part designed to be used with the others . . . not an assembling proposition.

The GRAVELY products are sold and serviced through Dealers, for all GRAVELY Dealers are qualified to render service on the machines they sell. Write us that you may check with our representative in your neighborhood. Like the product, you will find our sales policy practical . . . you are not asked to buy a machine without first being shown what it will do,—under your very own conditions.

## EXCLUSIVE GRAVELY FEATURES

There is a 5 H.P. motor . . . two forward and reverse speeds . . . an automotive type differential . . . a worm gear drive running in oil . . . one spot lubrication system for both tractor and motor . . . NO CHAINS . . . an oil bath air cleaner . . . an oil filter to clean and strain the oil . . . a SAFETY SLIP CLUTCH individually incorporated into each power attachment . . . and many, many others.

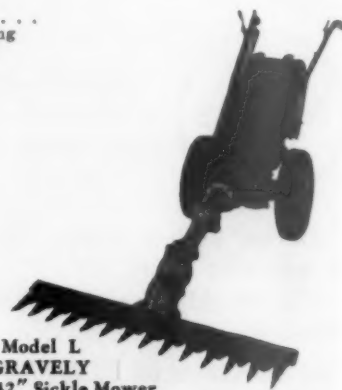
Learn more about a machine that for TWENTY years has been improving the appearance of schools and universities and at the same time reducing upkeep costs.



Model L  
GRAVELY  
with  
30" Rotary Mower

Ask for our catalog entitled:

"MAKING AND  
KEEPING  
A BEAUTIFUL  
LAWN"



Model L  
GRAVELY  
with 42" Sickle Mower

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# PIONEER GEN-E-MOTOR

5841 West Dickens Avenue

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Pincor Products, the result of years of development and research by Pincor engineers, are built to the high standards of design and craftsmanship that Pincor clients have become accustomed to through the years.

Throughout the world the name Pincor has become synonymous with dependability and efficiency of operation.

BUY MORE WAR BONDS

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POWER LAWN MOWERS  
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**PINCOR**  
*Products*

# STANDARD MFG. & SALES COMPANY

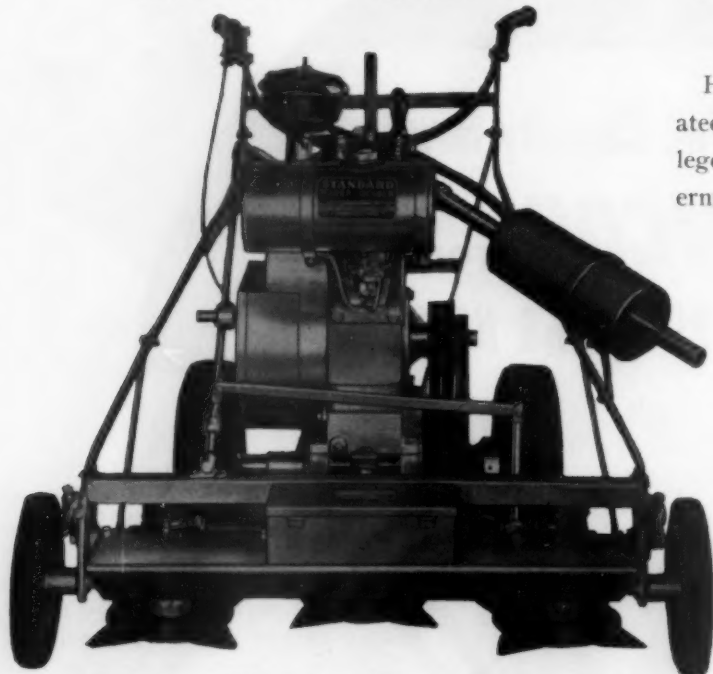
Lebanon, Indiana

## STANDARD POWER MOWERS

Large schools, colleges, parks and estates use STANDARD Power Mowers

Solve Every Mowing Problem

A Mower and Attachment for Every Purpose

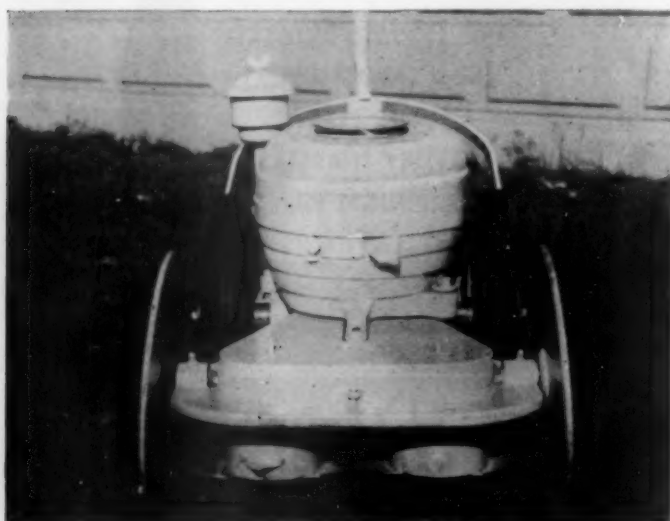


### THE STANDARD ROTARY CUTTER

Has been on the market for ten years, and operated under the hardest kind of service. Used by colleges, parks, schools, large estates, cemeteries, Government facilities, etc. Some individual users have as many as 14 of these mowers in use and are still replacing other mowing equipment with Standard mowers. Standard Power mower has been developed into the most versatile cutting device in the field—cutting lawn-grass, dandelion, buck-horn, Johnson grass or any other standing growth without cumbersome attachments. It will cut evenly at any height; permits high mowing.

Leaf Pulverizer attachment is a long desired solution for your leaf problems. Gathers, pulverizes, disperses leaves as a fertilizer for your lawns.

Model	Width of Cut	H.P.	No. Cutters	Capacity
Model A-9	25"	2	2	5-6 acres
Model AA-9	30"	2	2	6-7 acres
Model B-9	37"	3	3	7-8 acres
Model BB-9	48"	4	4	9-10 acres
Model C-9	62"	4	4	10-12 acres



The "Poynter" Mower



Mowing in a Big Way—Two 5-foot Mowers and Trailers



An Answer to Your Snow Problems

WRITE FOR FULL DESCRIPTION OF ALL STANDARD EQUIPMENT AND DEMONSTRATION BY LOCAL DEALER

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# PITTSBURGH PLATE GLASS COMPANY

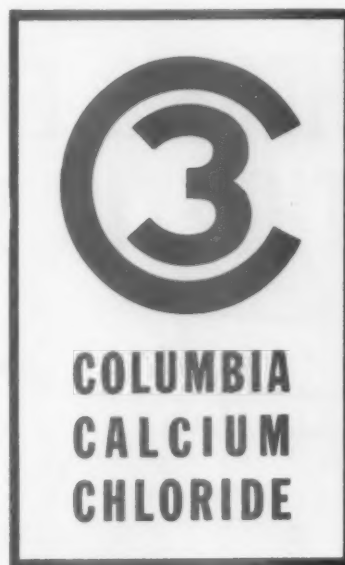
## COLUMBIA CHEMICAL DIVISION

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### A year 'round AID around the SCHOOL

USE COLUMBIA CALCIUM CHLORIDE FOR  
DUST CONTROL IN SUMMER . . .  
ICE CONTROL IN WINTER



COLUMBIA CALCIUM CHLORIDE provides the positive dust control so desirable for many areas around the school. Playgrounds, tennis courts, athletic fields, driveways and roads—wherever dust is a hazard to health and a detriment to proper use of facilities—can be kept free of dust with Columbia Calcium Chloride.

Easy and economical to use, Columbia Calcium Chloride absorbs moisture from the air and assures a moist, compact, dust-free surface. In general, only two applications per season are required—one at the outset of the season, another and lighter application about six to eight weeks later. The applications can be made manually; or for large areas, mechanical methods are available.

During the winter, Columbia Calcium Chloride serves as an important safeguard against the hazards of icy walks and stairways. Even at zero temperature, it melts ice, makes cleaning easy. Mixed with cinders or sand, Columbia Calcium Chloride skidproofs drives and roadways much more effectively and quickly than untreated abrasives.

THE AMERICAN SCHOOL AND UNIVERSITY—1944

Columbia Calcium Chloride, in easily handled white flake form, is packed in 100 pound moisture-proof paper bags.

#### COLUMBIA CLEANER AND CLEANSER

A specially prepared white powder for general use in all hand cleaning operations, such as those required for china and glassware, kitchen equipment, etc. Contains no harmful inactive ingredients; dissolves in water rapidly and completely.

#### COLUMBIA DETERGENT

A carefully blended mixture of the scouring type, especially suitable for the cleaning of large areas such as enameled and painted surfaces and tile or marble walls and floors. Contains no ingredients which can scratch or harm surfaces of this type.

Write for descriptive folders on these  
Columbia products and for prices and  
the name of your nearest distributor





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*Alkalies and Chemical Products Manufactured by The Solvay Process Company*

40 Rector Street, New York, N. Y.

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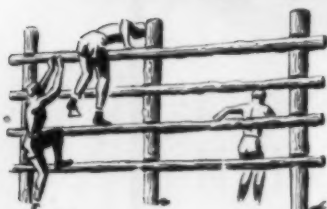
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# HERE'S EASY WAY TO KEEP ATHLETIC FIELDS DUST-FREE ...AT LOW COST!



Faced with less man power?  
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Calcium Chloride can provide  
the answer to keeping your  
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Simply apply this material  
on cinders, clay, bluestone,  
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Chloride can be applied by  
anyone—no experience or spe-

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treatment is clean, odorless, colorless  
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... cost averages only 3¢ to 4¢ per  
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Used for 25 years by leading  
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For Cleaner, Weedless  
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**SOLVAY CALCIUM  
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**WRITE FOR FREE FOLDER TODAY!**  
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Rector Street, New York, N. Y., or use  
the postage paid American School and  
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book.

# ANCHOR POST FENCE COMPANY

Complete Line of Fences and Playground Equipment

6695 Eastern Ave., Baltimore, Md.

SALES OFFICES IN PRINCIPAL CITIES

## ANCHOR FENCES FOR SCHOOLS AND SCHOOL PLAYGROUNDS

The Anchor Post Fence Company has been serving public schools and colleges, municipalities and industrial plants with fencing and playground equipment to suit their various requirements for half a century.

### Anchor Chain Link Fences

Makers of America's first chain link fence, the Anchor Post Fence Company today manufactures a complete line, and will be glad to supply any interested school executive or architect with a copy of our Chain Link Fence Catalog containing full information about the four exclusive features which make an Anchor Chain Link Fence exceptionally attractive and durable. Ask for Catalog No. 110.

### Anchor-Weld Iron Fences and Gates

Through the exclusive Anchor-Weld method of construction, the Anchor Post Fence Company is able to manufacture iron fences and gates which equal in appearance many expensive hand-wrought products. Many schools throughout the country are today justly proud of their beautiful Anchor-Weld Ornamental Iron Fences and Gates. Some of these are to be found illustrated in our Catalog No. 111.

### Anchor's Four Exclusive Features

1. **ANCHOR-WELD WIRE GATE**—built with a frame of square tubular steel—arc-welded at the corners. The square shape of the heavy steel tubing, together with the welding of the corners, provides a framework of such exceptional strength that no re-enforcing diagonal braces are needed. We claim that this is the strongest and most attractive wire gate made.

2. **SQUARE TERMINAL POSTS**—stronger because they are square in section. More protective—having no fabric-holding bands and therefore providing no footholds for climbing. Better-looking—because of their graceful lines.

3. **U-BAR LINE POSTS**—made of high carbon steel and U-shaped in section to insure maximum strength.

4. **DRIVE-ANCHORAGE**—grips the soil like the roots of a tree. We have imitated nature's engineering by providing the line posts with a broad foundation. Anchor drive-anchors defy thaws, frosts and the many other strains to which a fence is subjected.

Note: While we strongly advocate the drive-anchor method of setting posts, we can, if desired, set our posts in concrete footings when conditions warrant such a procedure.



Anchor  
Drive-  
Anchorage



Anchor-Weld  
Wire Gate



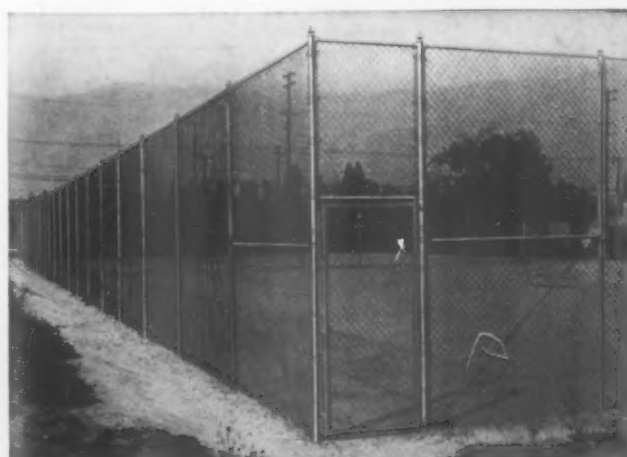
Anchor Chain Link Fence with Top Rail  
High School, Mineola, N. Y.



Anchor  
U-Bar  
Line Post



Anchor Square  
Terminal  
Post



Anchor Chain Link Tennis Court Enclosure at Pasadena  
High School, Pasadena, Calif.



Anchor-Weld Fence Surrounding St. Anne's School,  
Fall River, Mass.

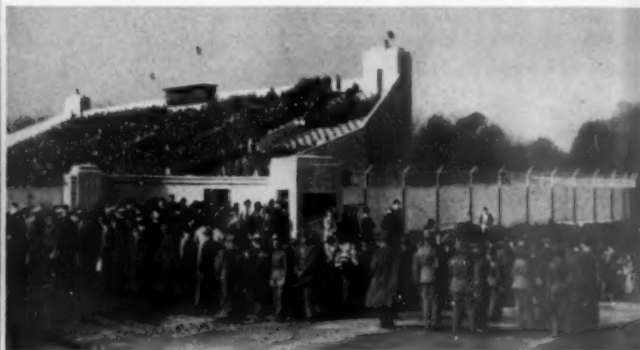
# CONTINENTAL STEEL CORPORATION

Manufacturers of Chain Link Fence for All Purposes

General Office: Kokomo, Indiana

## SALES REPRESENTATIVES IN THE FOLLOWING CITIES

Alexandria, Austin, Atlanta, Canton, Chicago, Columbus, Dallas, Dayton, Des Moines, Detroit, El Paso, Evansville, Ft. Wayne, Grand Rapids, Indianapolis, Kansas City, Louisville, Minneapolis, New Orleans, New York, Norfolk, Oklahoma City, Omaha, Philadelphia, Richmond, San Antonio, South Bend, St. Louis, St. Paul, Toledo, Tulsa, Wichita



### COMPLETE CHAIN LINK FENCE

To meet the fencing requirements of schools and universities, Continental has developed a wide range of structural variations in its Chain Link fence. The selection in styles, heights, types of top construction, gates and accessories makes it possible for schoolmen to select the best fence for any installation.



### FABRIC OF KONIK STEEL

The wire fabric in Continental Chain Link fence is made of KONIK—a new steel containing copper, nickel and chromium for greater strength and rust resistance "clear through." This superior fence fabric carries a zinc coating applied by a special hot dip process to insure uniformity and adhesion of the coating to the base steel. A uniform, bright finish enhances the appearance of Continental fence fabric. Wire is full gauge and woven in exact mesh.

**NOTICE:** During wartime, Continental Chain Link Fence is needed to protect war plants and military installations. Its sale is regulated by government rulings. Effective April 30, 1941, Continental Steel Corporation complied with OPM Division of Priorities Order No. M-5 (Nickel Bearing Steel) and discontinued adding nickel to steel used for Chain Link except where specified on a Defense Order.

### 12 STYLES

Continental offers 12 styles of top construction for Chain Link fence. Six popular styles are illustrated to the right. Continental fence is engineered for each specific job.

### POSTS AND FITTINGS

Continental fence has heavier, sturdier posts with improved brace construction. Top rails are joined by a special Inside-Outside coupling. Post caps and barbed wire arms are sturdy, heavier. Self-locking slots hold barb wire. New type lock pin eliminates bolts and nuts for fastening fabric to tension bands.

### GATES

Strong and easily operated gates and locking devices. Single and double types with improved pivot type hinges. Manually or mechanically operated.

### ENGINEERING AND ERECTION SERVICE

Our engineers are prepared to assist you in laying out the most economical installation for your purposes. Trained erection crews are available for correct and economical construction anywhere. When local labor is used Continental will supply competent foreman and inspection service.

### SEND FOR FREE MANUAL

This file size book contains more than 100 illustrations, will help you evaluate fence protection, select right style of fence. Write the

CONTINENTAL STEEL CORPORATION  
KOKOMO, INDIANA



### A STYLE TO MEET EVERY SCHOOL NEED



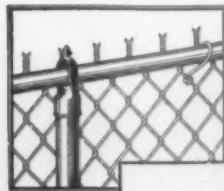
**Style 3B-R—**Three strands of barb wire with top rail. Arm of 12 gauge pressed steel. Barb wire held in angle slots and automatically locked in place by tension.

**Style 3B-W—**Same with No. 6 gauge coil spring tension wire instead of top rail.



**Style 5B-R—**Five strands of barb wire with top rail. Top rail of tubular steel 1 1/2" O.D. Has 7" expansion sleeves.

**Style 5B-W—**Same with No. 6 gauge tension wire instead of top rail.



**Style NB-R—**No barb wire with top rail. **Style NB-W—**Same with No. 6 gauge tension wire instead of top rail.



CONTINENTAL  
SUPERIOR  
STEEL

# CONTINENTAL CHAIN LINK FENCE

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NIZED AND SPECIAL COATED SHEETS  
• BILLETS • SHEET BARS • WIRE RODS

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# CYCLONE FENCE DIVISION

(American Steel & Wire Company)

## UNITED STATES STEEL

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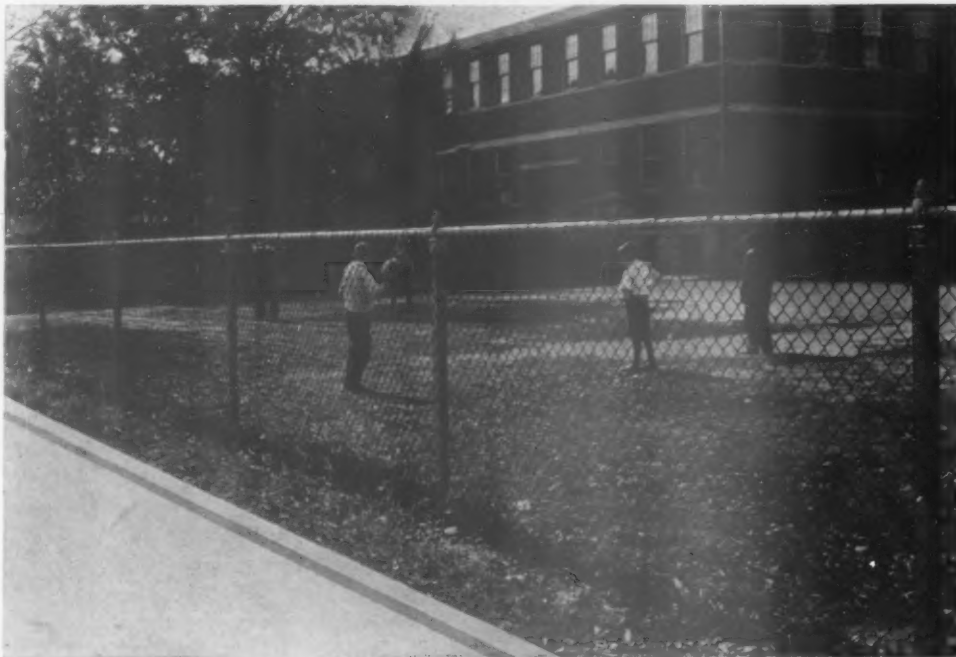
**C**YCLONE FENCE is the economical, serviceable enclosure for school yards, playgrounds, athletic fields, outdoor pools. For years Cyclone has specialized in fencing school property. Cyclone Fence is the recognized standard for every school and playground purpose.

School grounds enclosed with U.S.S. Cyclone Fence provide maximum protection for your school children.

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Because of its long, trouble-free service, you will find Cyclone Fence most economical in the long run. In every detail it is made for durability and long life.

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Cyclone Safeguard Chain Link Fence for School Grounds, Playgrounds, Parks, Institutions, Etc.

now. Send for our free booklet: "Your Fence—How to Choose It—How to Use It." The 32-page book is packed with information you will want on Cyclone Fence, Tennis Court Enclosures and Window guards. Ask for a free estimate. We will let you know just as soon as we can provide the fence you need.



Cyclone Invincible Chain Link Fence for Athletic Fields



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# THE STEWART IRON WORKS COMPANY

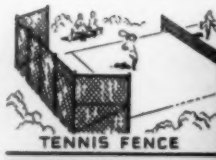
"Fence Builders to America Since 1886"

INCORPORATED

1103 Stewart Block, Cincinnati, Ohio

## PRODUCTS

Bronze Tablets  
Chain Link Wire  
Fence and Gates  
Flag Poles  
Folding Chairs  
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## PRODUCTS

Iron Fence and Gates  
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Stadium Seat Brackets  
Window Guards  
Wire Mesh Partitions

## FOR EVERY PURPOSE

Stewart offers Plain or Ornamental Iron and Chain Link Wire Fence and Gates for front, side and rear property lines; for athletic fields, tennis courts, recreation grounds and other school requirements.

Stewart Chain Link Wire Fence is the only ALL BEAM FRAMEWORK construction on the market.



Style 0TH Chainlink Wire Fence



Style 3TH

The Chain Link Wire Fence illustrations clearly show this exclusive feature. Notice the 3TH Oval-Back I-Beam Line Post with integral extension arm. Obviously this solid post is superior to pipe or other types of post requiring a separate pressed steel arm which may be removed or easily broken. Notice, too, that the beam top rail passes through the post itself—eliminating the need for fittings. The flat, smooth surfaces of Stewart All Beam construction offer maximum resistance to wear, weather and corrosion. This



Iron Fence Installation, Erie, Pa.

type of fence structure, exclusive with Stewart, is the heaviest and strongest manufactured.

Usual heights of style 3TH shown in illustration are 7 ft. and 8 ft. overall. All materials are of Copper-Bearing Steel hot-dipped galvanized after fabrication to assure greatest possible resistance to rust.

## IRON FENCES AND GATES

For front property lines where dignity as well as protection is a requisite, Stewart offers a multiplicity of designs in plain or highly ornate iron. Here again Stewart construction is unique. The patented channel rail, exclusive with Stewart, adds immeasurably to the strength of the fence. All fittings are of Stewart design—the result of more than 56 years' experience and research in the fence building field.

## METAL FOLDING CHAIRS

Built of strong steel channels. Full size seat with correctly pitched form-fitting back. Stewart Metal Folding Chairs are tip-proof. Standard finishes are: Black, Brown, Dark Green, Mahogany or Taupe. Literature and prices furnished upon request.



## WIRE PARTITIONS

Effective and economical enclosures for locker rooms, stock rooms, supply rooms, tool rooms, machinery, power houses, etc. When writing for prices please send sketch giving measurements.



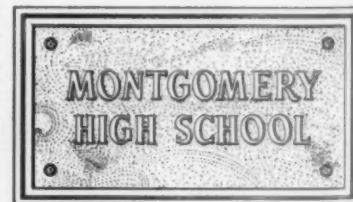
## BACKSTOPS

Ideal for hard or soft baseball diamonds, tennis and badminton courts, etc. Sturdily constructed to stand the toughest abuse. Literature and prices furnished on request.



## BRONZE PLAQUES

Plaques and tablets of hand-chased cast bronze, are available in stock sizes from 9" x 16" to 24" x 36". Special sizes will be made to order. Literature and prices gladly sent on request.



## CATALOGS — SALES AND ERECTION SERVICE

Literature is available on all Stewart products. If interested in Chain Link Wire Fence ask for Catalog No. 79. If in Iron, ask for Catalog No. 81. When requesting catalogs, please indicate products in which you are primarily interested.

Stewart maintains sales and erection offices in all principal cities. Consult your local classified telephone directory or write direct to factory

THE AMERICAN SCHOOL AND UNIVERSITY—1944

# WICKWIRE SPENCER STEEL COMPANY

General Sales Office (Fence Dept.), Rand Building, Buffalo 3, N. Y.

## DISTRICT SALES OFFICES

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**T**HE Wickwire Spencer Steel Company offers Chain Link Fences for all types of property, including schools, playgrounds, athletic fields, tennis courts, etc. Manufactured entirely in their own plants with complete control from mine to consumer. Sold with complete installation, or if preferred, we will furnish all necessary materials to be installed by others or with the services of a supervising foreman. All posts are furnished to set in concrete footings. (Concrete preserves the metals from corrosion below the surface.) All materials except non-ferrous metals are hot galvanized after fabrication.



**Wickwire Spencer Type 420H Fence**, using "H" section line, end, corner and gate posts. A design virtually foolproof as no bolts or nuts are exposed for possible tampering. Gates of similar construction using heavy square tubing with specially reinforced heavy hinges and locking devices. If desired, this type of fence is available with copper bearing pipe posts throughout.



**Wickwire Spencer Tennis Court Design.** Illustration shows a typical Tennis Court Fence design. Two types are available—310 (light construction) and 420 (heavy construction). Standard heights, 8', 10' and 12'.



**Wickwire Spencer Type 425 Fence.** Same as Type 423, except that five strands of barbed wire are used, supported by a triangular arm.



**Wickwire Spencer Type 423 Fence** with three strands of barbed wire. Illustration shows pipe posts throughout. Gates to match. This type is also available with "H" posts same as shown in Type 420H illustration, with gates of similar construction.

Write to this office direct, or to any of our district offices shown above, for catalogs, and full particulars. Distributors may be located near you. Ask us who they are. Estimates and engineering services will be furnished without any obligation on your part.



# AMERICAN PLAYGROUND DEVICE CO.

Anderson, Indiana, U. S. A.

The *Finest* in Playground Equipment — Swimming Pool,  
Park and Beach Equipment



## Approved!

### AMERICAN EQUIPMENT FOR YOUR SCHOOL

Your entire community looks to you, as its acknowledged leader in recreational activities, to provide safe, healthful, wholesome play facilities for its children . . . to safeguard the physical fitness, the morale and the welfare of tomorrow's citizens in today's war emergency. You can now select the NEW, dependable American Physical Fitness Equipment you need to round out your playground and swimming pool facilities. We urge you to write NOW for illustrated literature on APPROVED American Equipment.



American Playground Equipment is designed to provide healthful, SAFE play facilities for the greatest possible number of children, without the need for constant supervision

## AMERICAN PLAYGROUND DEVICE CO.

*Anderson, Indiana*

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Illustrated  
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HEAVY-DUTY SLIDES  
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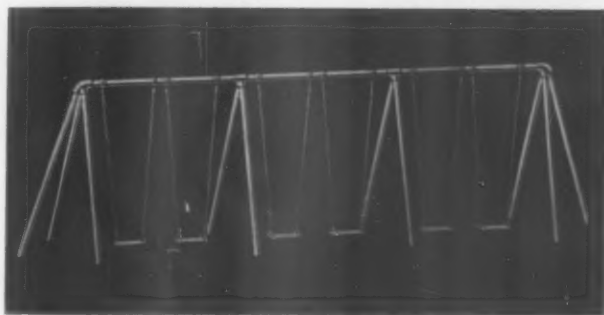
HORIZONTAL LADDERS  
SEE-SAW OUTFITS  
COMBINATION UNITS

## AMERICAN EQUIPMENT IS FOREMOST IN PERFORMANCE *and* CONSTRUCTION

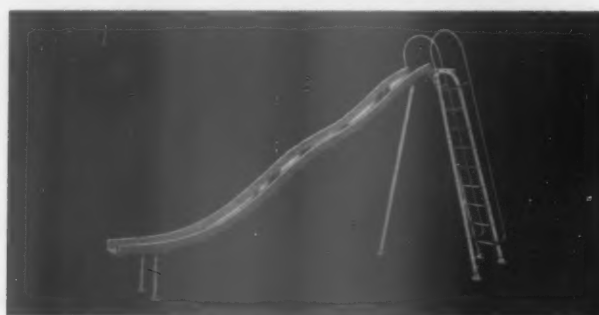
Our 33 years of successful experience has taught us that Playground Equipment must be built with finest materials and honest, skilled workmanship, if it is to give SAFE, dependable, and permanently satisfactory service. That is why AMERICAN EQUIPMENT has won nation-wide approval and preference among leading educational authorities. NEW materials of pre-tested durability are used throughout—new steel pipe, extra heavy duty Certified Malleable Fittings, rust-proofed by the hot-dip galvanizing process—bolt-through construction, with no threaded sections to weaken the structure—chain tested to 10 TIMES any possible overload—all combined with clear hardwoods, selected for resistance to stress and strain and weather. Such equipment is the only kind any school can really afford.



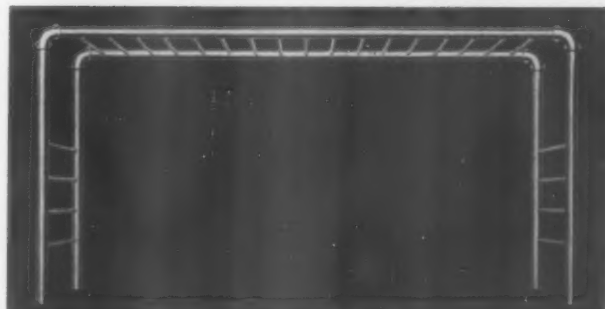
EQUIPMENT SHOWN BELOW IS APPROVED UNDER THE U. S. OFFICE OF EDUCATION'S VICTORY CORPS PROGRAM



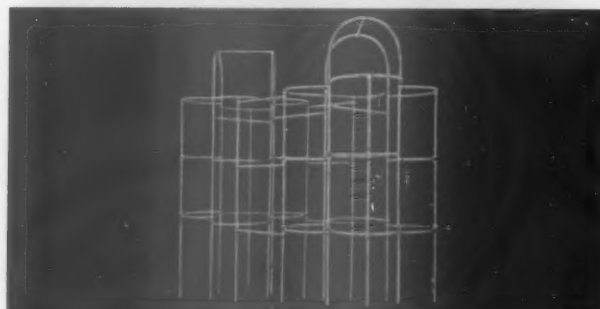
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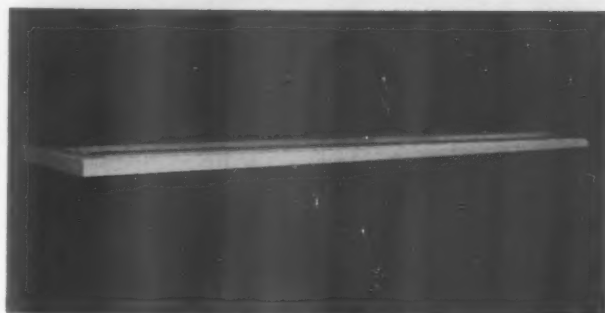
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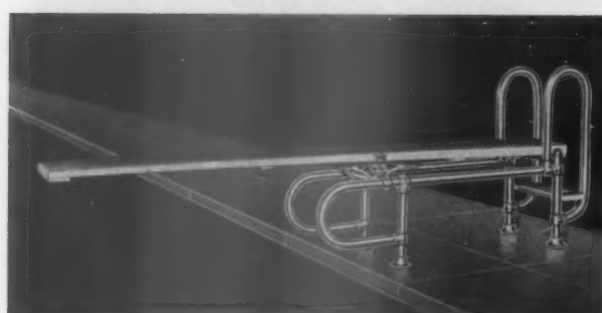
Horizontal Ladders



Castle Towers



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THREE-METER DIVING UNITS  
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# THE J. E. BURKE CO.

Fond du Lac, Wisconsin



**PLAN with BURKE**

**Y**OUR post-war plans no doubt include the further development of recreational facilities for your children—the future leaders of your city. You may want to add several new items of equipment, as well as replace old and broken parts.

Why not let us assist you in planning your post-war playgrounds; you'll be assured of the finest equipment money can buy! Burke-Built Playground Equipment has won the approval of park and playground officials throughout

the country—it's quality constructed of the highest grade materials.

Designed to give maximum recreation enjoyment in safe healthful play, Burke equipment is built to last indefinitely.

• Write for our complete catalog and any additional information on items in which you are especially interested.

*For a Complete*  
**Burke-Built PLAYGROUND**  
SWINGS • SLIDES • SEE-SAWS  
CLIMBING STRUCTURES  
MERRY-GO-ROUNDS  
TURNING BARS • HORIZONTAL  
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*The* **J. E. BURKE CO • Fond du Lac, Wisconsin**



# THE EVERWEAR MANUFACTURING COMPANY

Springfield, Ohio

SAFETY  
DURABILITY  
BEAUTY  
PLAYABILITY

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THE HEART OF THE ENTIRE RECREATION PROGRAM IS THE CHILD

**Y**OUNG PEOPLE, older than children, too, need recreation and physical exercise. EverWear Recreation Apparatus is built strong and SAFE enough for use by every age.

EverWear Playground Apparatus, EverWear Swimming Pool Equipment and EverWear Basket Ball Backstops will soon again (when the restrictions of war are removed) be serving those whose heart interest lies in furnishing healthful recreation to all who need it. Write now for catalogs, which will be mailed when new ones are printed, after the war is won.

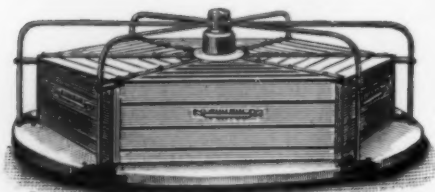
# GENERAL PLAYGROUND EQUIPMENT INC.

Kokomo, Indiana

## FUN-FUL PLAYGROUND AND SWIMMING POOL EQUIPMENT



Climbing Structures



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Slides



### SWINGS

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### The HILL-STANDARD LINE

OUR PLAYGROUND AND SWIMMING POOL APPARATUS HAS BEEN USED BY THE MAJORITY OF THE LEADING PARKS, RECREATIONAL CENTERS, ATHLETIC CLUBS AND Y. M. C. A.'s FOR MANY YEARS. YOU WILL FIND DESCRIBED IN OUR CATALOG THE LARGEST LINE OF PLAYGROUND AND SWIMMING POOL EQUIPMENT MANUFACTURED BY ONE COMPANY

WRITE FOR CATALOG NOW!

### Diving Apparatus



Combinations

THE AMERICAN SCHOOL AND UNIVERSITY—1944

# RECREATION EQUIPMENT CO.

Manufacturers of Playground, Swimming Pool and Basketball Equipment

724-26 West Eighth Street, Anderson, Indiana



## SLIDES

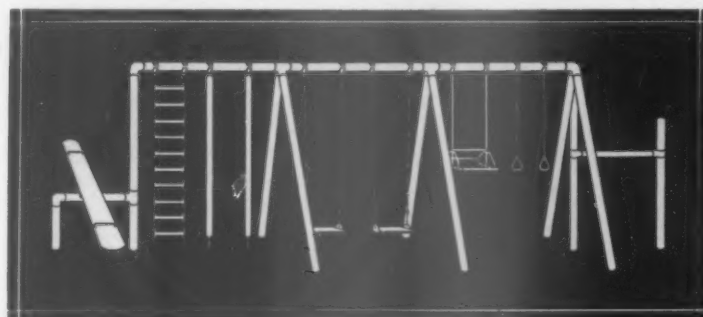
Great variety for both the playground and swimming pool use is offered. Many sizes and of different materials.

## THE RECREATION LINE



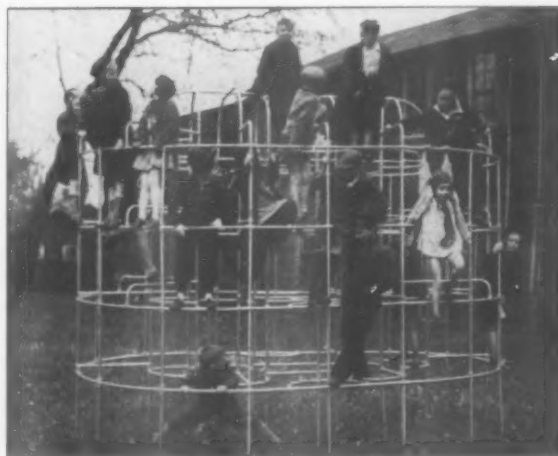
## BICYCLE RACKS

Several different types and sizes, hot galvanized steel and malleable throughout. Either duplex or single-side design.



## COMBINATION SETS

We offer a variety of gym combinations and swing sets in different sizes.



## MONKEY JUNGLE

The "Monkey Jungle" is the king of all climbing devices. Many other styles and sizes available.

## FOR THE PLAYGROUND

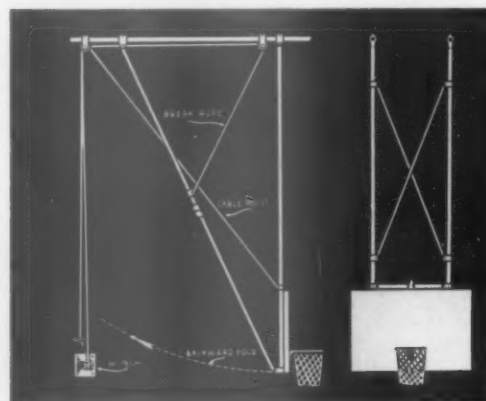
Swings, Slides, Merry-go-rounds, Climbing Structures, See - Saws, etc.

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Basketball equipment of a great variety.

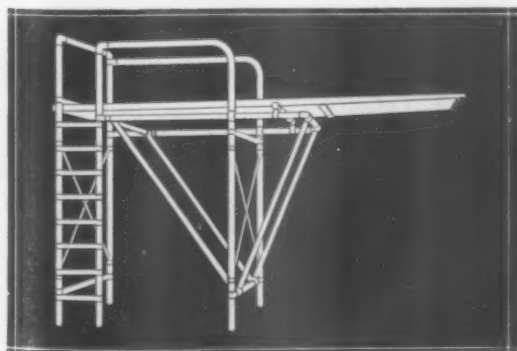
## FOR BEACH AND POOLS

Diving Board Outfits, Ladders, Slides, Pool Cleaning Equipment, Diving Mask Outfit, etc.



## BASKETBALL BACKSTOPS

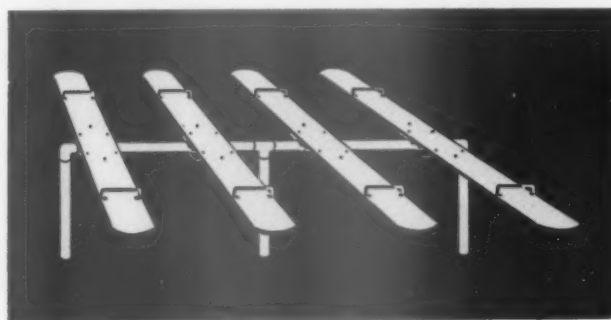
Full equipment for outdoor or indoor use with various types of mounting. Both rectangular and fan-shaped backboards.



## DIVING BOARD OUTFITS

Official regulation championship diving boards with different types of frames.

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# PITTSBURGH - DES MOINES STEEL COMPANY

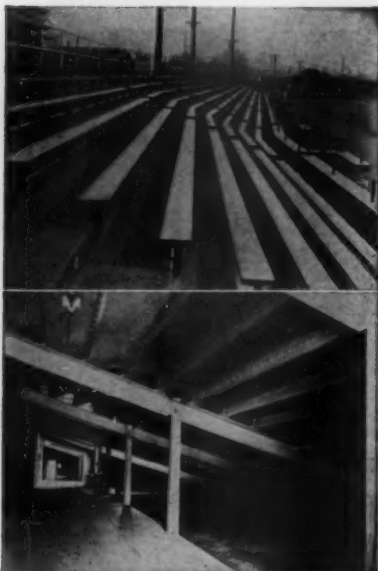
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## Steel Deck Grandstands

*The following information is presented for its usefulness in suggesting a long-range planning program for better outdoor seating. These P-DM products are not available during the national emergency.*



Note the Sturdy Construction of the Deck and Supports—Clearly Illustrated in the Two Close-up Views. Substantial Handrails Surround the Stand, and May Also Be Installed to Divide It Into Sections

Pittsburgh-Des Moines Steel Deck Grandstands are used on all types of athletic fields and for indoor arenas. They are built in standard sections 18 feet long by 10 rows deep, each section seating 120 people. A stand may be any number of sections long by any number of sections deep. Its seating capacity may be increased from time to time, double decked if necessary, and no matter how often enlarged it will always present a neat and finished appearance. A roof may be provided over all or a portion of the stand.

The wood seat planks supported on cast iron or welded steel stools are securely bolted down to the deck. Other types of seats are furnished if desired. Aisles, at proper intervals, extend from front to back with walkways along the front or back if necessary. Entrance or exit is accomplished by means of stairs or ramps at the lower end of each aisle, or through wells in the stand.

The steel deck is built to shed water. Hence the space under the stands may be utilized for dressing rooms, toilet facilities, storage, etc. In a number of instances masonry walls have been built along the ends and back so as to totally enclose the space under the stands.

These stands are permanent. They do not weather, rot or decay and therefore will not weaken and collapse. Their first cost is low, and they have a high salvage value. Being assembled by means of bolts, they can be dismantled and re-erected at another location—a feature not possible with other types of construction. An occasional coat of paint, the only maintenance necessary, keeps them looking new year after year.

*Write our nearest office for our latest "Steel Deck Grandstands" Bulletin, and any additional information you may desire for future planning.*



Louisiana State University Division at Monroe, La. Masonry Enclosure. Seating Capacity, 4000

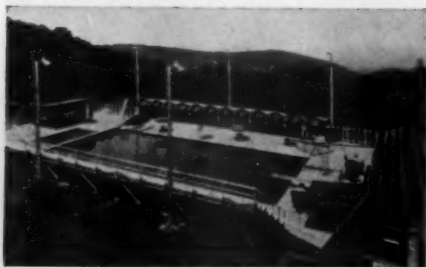


Southwest Stands — Penn State, State College, Pennsylvania, Seating Capacity, 8160



Waterbury, Connecticut, High School. Masonry Enclosed Sides and Rear. Seating Capacity, 4400

## All-Steel Swimming Pools



Summit Hotel, Uniontown, Pennsylvania  
P-DM All Steel Pool and Accessories

Pittsburgh-Des Moines All-Steel Swimming Pools represent the best value in durability, economy and appearance to be obtained. Lower in first cost than properly-constructed pools of other materials, the P-DM All-Steel Pool requires no maintenance other than a coat of paint at reasonable intervals. It is absolutely watertight; withstands frost action and ground movement without harm; is smooth, sanitary and good-looking for a lifetime. Subject to business conditions, P-DM designs, fabricates and erects steel swimming pools complete with all accessories—under a responsible guarantee of satisfaction. Send for our "All-Steel Swimming Pools" Bulletin No. 402—of value for your reference files.

# WAYNE IRON WORKS

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Manufacturers of Folding & Rolling Gymstands, Steel Portable Grandstands, Permanent Stadiums, Fencing of all Types...



An example of a Wayne permanent outdoor stand. Decks or roadways are of concrete, cast in place, and risers are steel channels. Supporting structure is steel, built to rigid safety standards.



Steel Portable Grandstand costs only a few cents more per seat than ordinary wooden bleachers. Made in 16 foot units, up to 15 rows high.



Illustration shows Wayne Rolling Gymstand. One man, in five minutes, can open a thousand grandstand seats, and in equal time make them virtually disappear.



The Wayne Folding Gymstand fits snugly against the wall. Unfolded it provides mass seating, with maximum safety, comfort and visibility. Spring-counterbalanced these stands may be easily opened or closed by one person.



## DO YOUR PLANNING NOW!

As soon as war restrictions are lifted we will be ready to serve your peacetime requirements with new ideas and developments in mass seating equipment. In the meantime, remember . . . planning costs nothing.

Wayne Grandstands are designed and built to meet your specific conditions and are available in every style suitable for outdoor and indoor use. For maximum economy, several standardized types have been developed. Special requirements can usually be met by simple modification of standard designs. Write for illustrated descriptive literature, or outline your needs for our recommendation.

## A FEW TYPICAL WAYNE GRANDSTAND INSTALLATIONS:

**CALIFORNIA**—Gustine, 1st High School; Half Moon Bay, Union High School; Los Angeles, A. Lincoln High School.

**CONNECTICUT**—E. Hartford, High School; New Haven, Yale University; Watertown, Taft School.

**DELAWARE**—Newark, Univ. of Delaware; Wilmington, Alexis I. duPont School; Claymont, Archmere Academy.

**ILLINOIS**—Chicago, Crane Tech. High School; Chicago, Amundsen High School; Chicago, Loyola University; Oak Park, High School; Morrison, High School; Noble, Com. High School; Rochelle, High School.

**INDIANA**—Gary, Public School; Hammond, High School; South Bend, J. Adams High School.

**MAINE**—Orono, University of Maine; Blue Hill, Consolidated School.

**MASSACHUSETTS**—Cambridge, Mass. Inst. of Tech.; Cambridge, High and Latin School; Gloucester, High School; Northampton, High School; Chestnut Hill, Boston College; Waltham, High School; Worcester, Assumption College.

**MINNESOTA**—Collegeville, St. John's University; Rochester, Public School District.

**NEW HAMPSHIRE**—Nashua, Holman Memorial Stadium; Franklin, High School; Rochester, High School.

**NEW JERSEY**—Hightstown, Peddie School; Moorestown, High School; Paterson, Public School No. 18; Paterson, Public School No. 23; Princeton, University; Rutherford, Pierrepont School; Union, High School.

**NEW YORK**—Albany, Chris. Bros. Acad.; Geneva, Hobart College; Elmira, Public School No. 5; Fordham, University; New York City, Lafayette High School; Rochester, Spaulding High School; Vestal, Central School; West Point, U. S. Military Academy.

**OHIO**—Cincinnati, Western Hills High School; E. Cleveland, High School; Canton, McKinley High School; Dennison, High School; Newark, High School; Oberlin, College; Toronto, High School.

**PENNSYLVANIA**—Carlisle, Dickinson College; Duquesne, High School; Bethlehem, Lehigh University; Ardmore, Lower Merion High School; Pittsburgh, Duquesne University; Swarthmore, College; Jeannette, High School; Philadelphia, Hallahan Girls High School; York, Davis Junior High School; Uniontown, School District; Wayne, Radnor High School; Wayne, Valley Forge Military Academy.

**RHODE ISLAND**—Providence, St. Xavier's Academy; Providence, High School.

**TENNESSEE**—Kingsport, Dobbs-Bennett High School; Maryville, College; Sewanee, University of South.

**TEXAS**—Conroe, High School; Graham, High School; Huntsville, Sam Houston St. T. C.

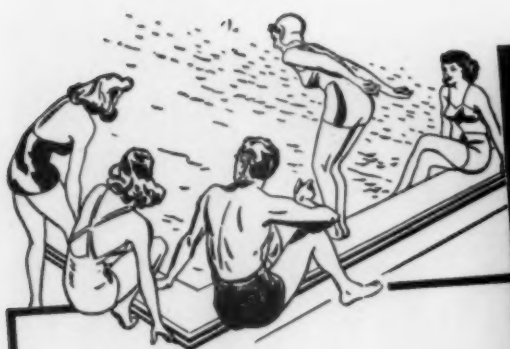
**VIRGINIA**—Grundy, High School; Norfolk, Granby St. School.

**WASHINGTON**—Clarkston, Public School; Custer, High School; Toutle Lake, High School.

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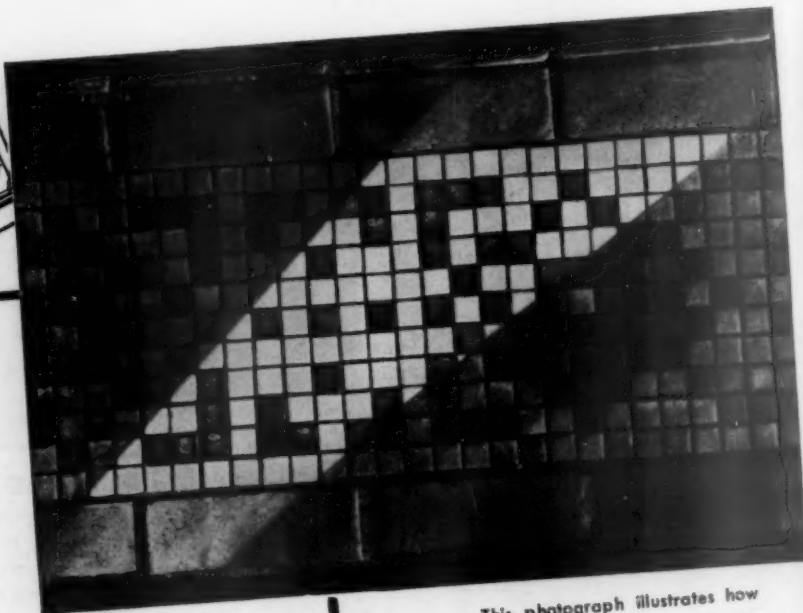
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THE AMERICAN SCHOOL AND UNIVERSITY—1944

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## INSTRUCTIONAL MATERIALS

*The primary purpose of a school building is to provide a place where learning can take place. That building is most efficient whose facilities are such that the learning process is facilitated and activated to the greatest possible extent. In such a building, instructional materials—books, charts, maps, globes, pictures—play a most important role. To provide information on various phases of the problems of effective instructional materials, this section of the AMERICAN SCHOOL AND UNIVERSITY is dedicated.*



## PROSPECTS FOR EDUCATION BY RADIO

By **WILLIAM DOW BOUTWELL**

Director, Information Service, U. S. Office of Education  
Washington, D. C.



**T**HE day is not far distant," says United States Commissioner of Education J. W. Studebaker, "when the slender shaft of a radio transmitter tower will be as familiar to the school scene as a flag pole."

Speeding the arrival of this day are many current influences. Among them are these:

1. Federal Communications Commission Chairman Fly's warning in September, 1943, to the Federal Radio Education Committee that the channels reserved for education would be given to others "unless educators actually get busy and fill them with educational stations. . . . For if education does not move into the home set aside for it, there will be plenty of others who will first seek and then demand admission to the vacant rooms."

2. The coming boom in FM after the war in which the consequent advantages of lower prices for transmitters and receivers will accrue to the benefit of educational installations.

3. Technological progress which is greatly increasing the potential areas served by FM transmitters and the quality and durability of all radio equipment.

4. Probable allocation of high frequencies for intercommunication between stations. This will make pos-

sible the exchange of programs among member stations of state or college educational networks without dependence on land wires.

5. Wider use of currently available network educational programs stimulated by the Educational Radio Listing Service inaugurated by the Federal Radio Education Committee. Through this service the U. S. Office of Education sends each month to state departments of education and other centers of distribution a selected and annotated list of programs especially useful for classroom listening. Adapted for local use, this listing service supplies a needed guide to the increasing number of teachers who wish to use radio as an aid.

### Educational "Controls" Needed

Education stands on the threshold of the technological revolution in communication in which radio will play a key role. Printing, which made possible the blessings of mass education, has become a ball and chain holding schools far back in the social procession. Thus while motion picture communication is the common experience of 50,000,000 or more Americans at least once a week, less than ten per cent of our

schools own sound-on-film projectors. Radio has outdistanced newspapers as a spokesman to the American people. Eighty-nine per cent of American homes now have radios. By contrast, probably less than ten per cent of our classrooms have radio receivers.

To attempt to explain away this disparity on the grounds that motion pictures and radio serve entertainment needs, fails to account for the very different situation in respect to printing. Books and magazines also entertain but that does not deter education from using millions of textbooks. No, the chief differences appear in the cultural lag of education and the failure to institute "educational controls" over radio and motion pictures parallel to those applied for many years to textbooks and libraries. Textbooks and other printed materials are patterned to fit the particular demands of school systems and colleges. In Cleveland, radio *does* occupy a prominent position in the educational process because the school officials use the board of education owned station, WBOE, as a flexible teaching aid, shaping and reshaping its programs from hour to hour to meet the particular needs of pupils and

teachers in Cleveland schools. War training films produced by the U. S. Office of Education have also met with success because they too advance step by step through an entire learning problem. Indeed, in this latter case, print occupies a position auxiliary to films. When similar "controls" are applied for other curriculum areas and functions, visual and radio aids will prove their sterling worth.

Only the Army and Navy seem to have the funds and willingness required to use the new technologies of communication to the hilt. Pressed for time, the Armed Services make more extensive use of visual and radio aids than any civilian educational enterprise. "G.I. Education" demonstrates in hundreds of camps how the fruits of technological advance can accelerate and improve the processes of education.

#### Will Five-Channel Band Be Inadequate?

Until recently it appeared that what use education made of radio as a new tool of communication would be limited to programs supplied by commercial stations and to recordings. Even the best intentions



Facing page, top—A pupil of the Emerson Elementary School, San Francisco, Calif., conducts a discussion following a current events broadcast

Facing page, bottom—The master control and transmitter of FM Station KALW located in Samuel Gompers Trades School, San Francisco, Calif.

Above—A radio broadcasting student interviews Mayor Rossi of San Francisco, Calif.

Right—The special events department covers an R.O.T.C. competition







Left—Students of Covina Union High School, Los Angeles County, Calif., work on the preparation of a radio script

Right—The students get valuable experience producing the script that they themselves have prepared



and expenditure of large sums of money by networks for excellent educational programs left the teacher at the crossroads school largely unmoved. With the appearance of FM radio broadcasting, the situation shows possibility of change. Reservation of FM channels for education means that school systems and colleges and universities can use radio much as they use text and reference books. After the war as many as 500 FM stations owned and operated by educational institutions and serving special educational needs can spring up. Such stations will not carry the entire educational burden any more than do textbooks. Just as schools use magazines and books as supplementary materials, so will they use the programs created by networks and local commercial stations. Commercial radio will supplement educational station programs.

Before the war closed down on equipment purchases, five FM licenses were granted. The school systems of New York, Cleveland, Chicago, San Francisco and the University of Illinois now have FM stations. Within the last year, other institutions of higher education and some school systems have either applied for licenses or taken preliminary steps. Many inquiries are coming to the U. S. Office of Education and to the Federal Communications Commission showing that school administrators are alive both to Chairman Fly's warning and the opportunities ahead for education by radio.

State departments of education and state universities are showing increasing interest in the prospect of state-wide federations of educational FM stations operating as networks. Eleven states have asked the U. S. Office of Education to prepare preliminary plans

showing how the five educational channels could be used to serve the largest number of schools. Michigan has placed the subject of a state-wide radio network before its post-war planning committee. One member of the University of Michigan staff has been assigned to consult school and college officials throughout the state.

At their December, 1943, meeting in Milwaukee, the Chief State School Officers Council adopted the following resolutions:

The Council requests the U. S. Commissioner of Education to maintain contacts with the Federal Communications Commission in order to safeguard the interests and opportunities of education in the development of F-M radio facilities and more particularly to preserve for educational use the channels already set aside by the Commission for such purposes, and seek additional channels if the need is indicated.

It is recommended that careful study be given in the several States toward the development of suitable plans for balanced State-wide utilization of frequency modulation radio broadcasting channels set aside for education by the Federal Communications Commission.

Other educational organizations including the National University Extension Association, the National Association of Educational Broadcasters (college and university stations), and the young and growing Association for Education by Radio, are strongly encouraging early post-war use of FM facilities. The latter, although only three years old, already has more than 800 members. Educators and commercial station personnel interested in education make up the membership. AER publishes a monthly journal, distributes scripts, sponsors numerous radio conferences, has encouraged the founding of Alpha Epsilon Rho (college

professional fraternity of students interested in radio), and has carried on numerous other projects.

Exploration of possibilities of state-wide educational radio service soon revealed that five channels would be scarcely enough. Recognizing this limitation and the probability that the whole radio spectrum will be subject to reshuffling after the war, United States Commissioner of Education John W. Studebaker has forwarded to the FCC the following request:

Dear Mr. Fly:

I understand that the newly-created Radio Technical Planning Board is already giving serious consideration to possible changes in the radio spectrum in the light of wartime technological changes and developing social needs.

I believe you will agree that any comprehensive study of the existing allocation pattern would need to take into account the radio broadcast needs of public education. Accordingly, I should like, at this time, to call the attention of the Federal Communications Commission to several considerations which, in my opinion, are basic to educational FM broadcasting in the immediate post-war future.

*First*, the shift of the education band from AM to FM reduced the available facilities from 25 channels to 5. Despite the fact that the 5 FM channels have distinct advantages over the AM channels, our preliminary studies reveal this allocation to be insufficient to meet education needs now in sight.

*Second*, many State departments of education hope to bring educational radio service to all the schools in their respective States. They hope to accomplish this through federations of well-located FM stations into educational networks for the exchange of programs. This desirable objective cannot possibly be reached in many States, we find, within the limitations of the existing 5-channel allocation for educational broadcasting.

*Third*, even in those States which might conceivably provide State-wide service within the present 5-channel band, very little if any leeway can be found for additional stations to serve the special needs of large city school systems or of major centers of higher education.

These three considerations, plus a careful estimate of the future potential use of radio by education, prompt me to lay before the Federal Communications Commission, the following requests. These requests are based on data which I shall be glad to supply the Commission. The requests go to you with the endorsement of educational organizations and leaders.

1. It is requested that the width of the present non-commercial educational FM band be increased to provide three times the number of 200-kilocycle channels currently available.

2. It is requested, further, that this expanded educational band be assigned immediately adjacent to the commercial band, so that school-owned stations may be able to bring their educational programs to all homes in their respective service areas which are equipped with standard FM receiving sets.

3. In order to assure the maximum utilization of all available educational frequencies with a minimum of inter-station interference, it is urged, that, as early as is practicable, regional and State-wide allocation plans be formulated for use as a guide for assigning frequencies to educational-station applicants.

4. To facilitate the exchange of programs among educational stations operating, on a network basis, to provide State-wide service, it is requested that a total of 10 relay-transmission frequencies be allocated for non-commercial educational use.

5. Although such interest in television as schools have indicated to date provide no adequate basis for predicting how soon, or to what extent the schools will become interested in television broadcasting, it is my firm belief that certain facilities of this kind should be reserved for educational use. To this end, I have recommended that at least two television channels be reserved for educational assignment.



Right—Students of Claremont (Los Angeles County) High School rehearse before they broadcast

Left—Lynwood Junior High School (Los Angeles County) students gather around their microphone to broadcast



# POST-WAR STANDARDS FOR COMMUNITY LIBRARY SERVICE \*

**L**OCAL and state educational agencies and organizations throughout the country are now planning for facilities and programs which will be needed after the war. School groups and library groups are cooperating in development of these plans and in clearing information as to the responsibilities and functions of each group and the interrelations between them which will further the achievement of their mutual objectives. Because the programs of schools and of libraries complement each other, it is important for each field to be informed about the planning of the other and to the extent it is appropriate, to take part in that planning.

## Statements of Standards

Information about two types of library standards is especially important for school planning groups: (1) standards for school libraries and (2) standards for public libraries. A new statement of standards for school libraries is being developed by a school library subcommittee of the American Library Association Post-War Planning Committee. When completed it will be published and made widely available.

The publication of *Post-War Standards for Public Libraries* provides basic information for planning in the field of public library service. The 92-page report was prepared by the A.L.A. Post-War Planning Committee, Carleton B. Joeckel, chairman, and was published by the American Library Association (520 N. Michigan Avenue, Chicago 11, Ill.) in 1943. The document provides important aid for library planning and is also valuable as background for state and local over-all planning for social and educational services and for governmental ways to provide them.

## Responsibility of the Schools

Educational planners are studying the relationship between the school and the community, and through observation of schools which are serving as community centers they are exploring what local school responsibilities of this nature should be. In communities thinking toward increased community services from schools, the relation of library service to the plan is studied. If there is no public library service in the area, how can the expanding school program assist in its establishment? Should the objective for the area be a county library or a joint county library serving several counties? If library service exists but is inadequate, how can the school aid in strengthening it? If there is a well-supported and effective library program in the area, are there additional ways in which schools and libraries can cooperate to further the whole community educational program?

The answers to these questions are important to library boards and librarians. They are important to boards of education and school administrators planning toward community school services. The public library standards help schools to know the objectives of public library service. They help school authorities to understand factors essential in providing

service through public library branches in schools. With them school administrators can face in advance the obligations involved in undertaking as a school function the provision of community library service to both adults and children throughout the year. They make it possible for planning groups to have full advantage of the thinking and experience resulting from years of study of library services.

## Excerpts from "Post-War Standards"

Because of their importance to schools planning broadened community services, excerpts from *Post-War Standards for Public Libraries* have been selected and reprinted here. Further explanation and amplification of details are given in the complete publication.

The impact of the present national emergency and contemplation of the inevitable difficulties of the post-war reconstruction period have awakened the American people to a determination to help make a better world in which to live. This new world must be *for* and *made by* the people. To achieve these ends, the agencies for the enlightenment of the people must be prepared for enlarged responsibilities.

One of these agencies is the public library. It is a peculiarly American institution. It originated here, and here it has attained its highest development.

It provides the means of self-education for all people in the community. It is a source of information on nearly every subject. It furnishes good reading for pleasure. It stimulates study and research, and helps to make possible many literary and scholarly achievements. It is basic to the education and continuous reeducation of the American people as citizens, workers, and as civilized human beings. It plays a significant role in making democracy work by helping citizens to be enlightened participants in public affairs. It has come to be recognized as an essential part of our social and educational equipment.

Important also in a program of education and social progress are the school, college and university libraries (allied with formal education) and the federal, state, research and special libraries. The public library must correlate its work with all of these as well as with other educational and social agencies in the community. This statement of standards is, however, concerned specifically with the public library. . . .

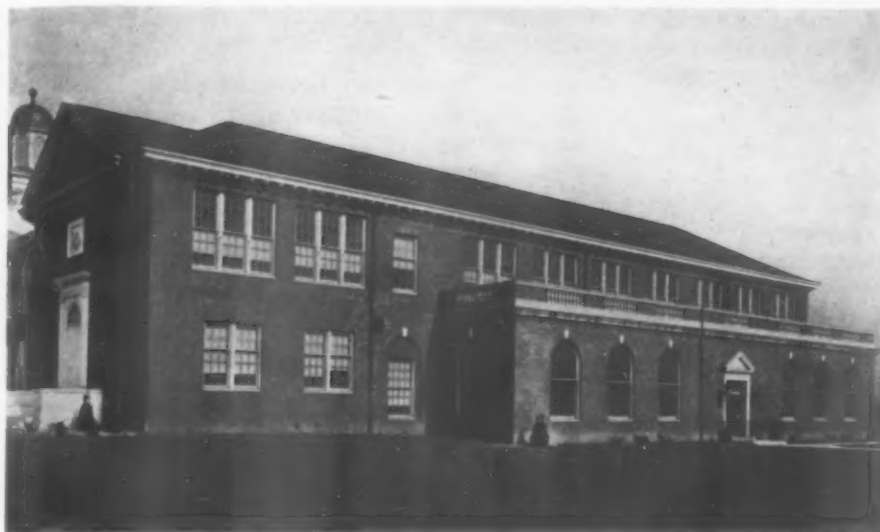
## Public Library Objectives

The essence of the many standards for public libraries contained in this study may be compressed into three basic elements, all of which are necessary in a planned program of library development:

1. Complete public library coverage
2. Library service of adequate quantity and dynamic quality
3. Large units and cooperation in library service

\* The information in this article was supplied by the American Library Association Headquarters Office.





The picture at the left shows a wing of the Central High School in Trenton, N. J. The first floor is occupied by the Briggs Branch of the Free Public Library

Underlying all other standards is the specification that public library service should be available without exception to all people and in all political jurisdictions throughout the nation. This standard of complete coverage is based on the premise that the services of the public library—opportunity for enlightened citizenship, continuing education, and intellectual and cultural development—are essential in a democracy. Therefore one of the major goals of the post-war period should be to provide good library service to the 35,000,000 people now without it. . . .

The achievement of the goals of a democratic society depends in large measure on the enlightenment of the people and on the vitality of their social and cultural ideals. The complexity and rapid tempo of the modern world put a responsibility on the citizen to educate himself continuously, and on the government to provide the means for the citizen's self-education.

The public library is an agency evolved by America to meet this need.

Every American resident should therefore have access to a public library capable of providing him with the materials by means of which ideas are communicated. These include books, periodicals, pamphlets, newspapers, maps, pictures, films, and recordings. Guidance in the choice and use of these materials should also be provided.

The objectives of the public library should be to assemble and preserve books and materials in organized collections, and through stimulation and guidance to promote their use, to the end that children, young people, men, and women may have opportunity and encouragement:

To educate themselves continuously

To keep abreast of progress in the sciences and other fields of knowledge

To maintain the precious heritage of freedom of expression and a constructively critical attitude toward all public issues

To improve their ability to participate usefully in activities in which they are involved as citizens of



Interior view of the Briggs Branch of the Free Public Library. A public library branch in a school building is of service to the whole community

both the United States and also of the entire world

To equip themselves, and to keep themselves equipped, for efficient activity in useful occupations and practical affairs

To improve their capacity for appreciation and production in cultural fields

To aid in the advancement of knowledge

To make such use of leisure time as will promote personal happiness and social well-being<sup>1</sup>

These library objectives are in effect merely an amplification and an adaptation of two of the "new objectives" for the American people proposed by the National Resources Planning Board:

The right to education, for work, for citizenship, and for personal growth and happiness; and

The right to rest, recreation, and adventure; the opportunity to enjoy life and take part in an advancing civilization.<sup>2</sup>

#### Standards of Library Service

Public library service should be free and universally available in the United States and its territories.

It is an obligation of the public library to integrate its services with the work of other social and cultural agencies.

In the larger municipal libraries and in county and regional libraries, service should be brought close to the homes of the people through systems of branches, mobile units, and other agencies of communication and transportation. Provision should be made for the organized flow of reference and reading aid<sup>3</sup> questions, inter-loan requests and other services among branches, extension agencies, and the central library.

In evaluating the library as an institution of democracy, all types of service require careful measurement. To use circulation as the only measure of library service is unsound. The information and guidance functions are equally important.

Effective public library service requires a program of public relations and reading stimulation which makes the public aware of library services and encourages the use of these services.

Library service should not be stereotyped in form or pattern but should be focused upon the varying problems of particular communities and changing times. Experimentation should be encouraged, both in kinds of service and in methods of recording and evaluating services.

Age distribution and the educational levels of the population served will affect the standards of library performance from community to community. . . .

#### Adult Education

Each library should develop an active program for informal adult education through reading, adapted to the needs of the particular community.

The library serving a population of 25,000 or more should have the services of an adult reading specialist with appropriate education, experience and personality to give reading guidance to individuals and

groups, and to stimulate interest in adult education through reading. . . .

#### Service to Children and Young People

Library service to children and young people should be an integral part of the organization of each public library. A special objective of the library's program should be to foster good reading habits in children and young people in order to develop an adult population that knows and appreciates books. There should be a planned program of direct assistance to parents, teachers, and other leaders of children.

There has been cause in individual communities for the existence of separate systems of public library service and school library service to children and young people. Governing boards and administrators of schools and libraries now have grave responsibility for cooperation between the two systems and for avoidance of competition. School librarians, children's librarians, and young people's librarians should be thoroughly familiar with the objectives and activities of the two types of services, both locally and nationally. . . .

#### Library Users

The number of registered borrowers in public library units should meet the following minimum quantitative standards, based on a three-year registration period:

For adult borrowers: 20 to 40 per cent of the population 15 years of age and over.

For juvenile borrowers: 35 to 75 per cent of the population from 5 through 14 years of age.

For both adult and juvenile borrowers the per cent of the population registered will tend to rise as the population of the unit served decreases. . . .

#### Circulation of Books

The circulation of books for home use in public library units should meet the following minimum quantitative standards:

For adult books: 3 to 10 volumes per capita for the population of 15 years of age and over.

For children's books: 10 to 30 volumes per capita for the population from 5 through 14 years of age.

For both adult and children's books the circulation per capita will tend to rise as the population of the unit served decreases. . . .

#### Government and Administration Standards

The public library is rightly a part of government, and library administration is a part of public administration. Therefore most accepted principles and standards in good government and efficient public administration should be applied to public libraries as well as to other public agencies. . . .

As a rule, the public library should be an integral part of general local government. Ordinarily, it should not be organized as a separate district or as a separate *ad hoc* authority. . . .

Several forms of library government are possible, and complete uniformity in the governmental status of the public library is not essential. Whatever the form, clear authority for establishment and maintenance should be provided by law. . . .

The public library should not be a subordinate part of the public school system, except under special

<sup>1</sup> "A National Plan for Libraries," A.L.A. Bulletin, XXXIII (1939), p. 138.

<sup>2</sup> National Resources Planning Board, National Resources Development for 1942 (Washington: Government Printing Office, 1942), p. 3.

<sup>3</sup> The term "reading aid" is used to include all types of advice and suggestion given to library users in connection with reading interests and problems except answers to reference questions.

circumstances. When the library is an agency of the school district, it should have its own board of trustees and should not be administered directly by the board of education. . . .

Public libraries and school libraries should work together to provide coordinated and complete library service to school children without unnecessary duplication of activities. . . .<sup>4</sup>

For libraries, as for schools, the state should accept responsibility for the provision of adequate service for all inhabitants. It should encourage the continuation and increase of local support and should assume a part of the cost of local libraries, through state appropriations to supplement local funds or to provide a minimum program. . . .

The federal government should recognize the inevitable inequalities in library facilities in the several states due to inequalities of taxable resources, and provide financial aid for libraries and library service to the end that reasonable opportunities to use and borrow books and other printed materials may be provided throughout the nation. These funds should be allocated to the states and territories through state

<sup>4</sup> Quoted with slight changes from *Schools and Public Libraries*, Report of the Joint Committee of the National Education Association and the American Library Association (Washington: National Education Association, 1941), p. 14.

library agencies on such terms as will be equitable and fair for the optimum development of library service. . . .

The control and administration of library service should remain with states and local units of government, which are primarily responsible for library support. Federal aid should be so administered as to encourage state and local initiative. . . .

#### *Size of Public Library Units*

Public library units should be large enough in population, area, and financial support to insure adequate library service.

The minimum essentials for adequate service are:<sup>5</sup>

Active and efficient administrative direction

Centralized financial administration and accounting

Centralized book purchasing under competent technical direction

Centralized (or centrally directed) cataloging and classification by trained personnel

A central reference collection of broad scope, including printed materials of all types

A central reservoir of circulating books large enough

<sup>5</sup> Joeckel, *Government of the American Public Library* (Chicago: University of Chicago Press, 1935), pp. 316-17.



Above—The regional library branch brings more and better books to boys and girls and their families than a local school or library could afford

Below—At this country school, adults as well as children borrow books from the bookmobile





and live enough to meet a wide demand from many types of readers

A staff of specialists sufficient to provide a high quality of general and technical reference service, readers' advisory service, service to adult groups, and service to children and schools

A system of community and school branches

Additional service to outlying communities through stations and bookmobiles

The minimum annual income for an efficient library unit in terms of these essential services is approximately \$25,000 a year, an amount which would normally provide service for a population of about 25,000. The most effective units will be considerably larger. . . .

The service area of public library systems should be determined in the light of varied and diverse conditions in density of population, topography, highways, trading areas, climate, and similar factors. . . .

#### *Types of Library Units*

The specific types of library units which should be encouraged will depend largely on special conditions in the different states. The following patterns of library units may be accepted as satisfactory, provided they satisfy standards as to size and economic ability:

1. Independent city libraries, to which may be added adjoining communities or contiguous territory by contract or other arrangement

2. County libraries serving the entire area of large counties

3. County libraries in large counties in which one or more cities constitute independent library units

4. Regional or multi-county libraries, consisting of several counties

5. A federated group of libraries in a natural region, not a unified governmental agency, but with carefully integrated cooperative services approximating those of a county or regional library

6. Special units, such as a small state organized as a single library unit, or state districts served by branches of the state library

Small public libraries below the specifications for size and income proposed in this section should consider carefully the definite advantages of affiliation with large units of one of the above-mentioned types. . . .

In determining legal organization and structure of public library systems, the objectives should be unity and simplicity, inclusion of all units in the area, and a governing authority representing the whole area. The resulting pattern will differ widely with varying state and local situations.

Services to other libraries in the county or regional area should be clearly defined by contract. Service to schools in the area should also be defined by contracts specifying the responsibilities to be assumed by the contracting parties, with the school system meeting the cost of service required by the school curriculum. . . .

Libraries serving large populations and large areas must make books and library service easily accessible

throughout those areas by systems of branch libraries and smaller distributing agencies or mobile branches.

The number, type, and pattern of distribution of these agencies will necessarily vary not only with the total population but also with the topography of the area, natural and industrial barriers, density of population, and other factors. The objective in each system is a flexible service, adjustable to changing transportation conditions and shifts of population. . . .

In county and regional libraries, a wider range in size and types of distributing agencies is necessary. Branches and stations should be in strategic locations, with facilities adequate for the population to be served. . . .

Mobile branches (bookmobiles, trailers, buses) are used effectively both in city and country for a flexible service to areas not densely populated enough to justify branch libraries. . . .

#### *Financing Library Service*

Authority for the establishment, maintenance, and financial support of public library facilities and service should have a sound basis in law. . . .

The establishment and maintenance of public library units should be determined by considerations of the minimum economic resources and population necessary to assure efficient operation. A separate public library should not be operated by a governmental unit unless it is reasonably assured of an annual income sufficient to maintain the standards of service defined elsewhere in this memorandum. Service of this quality will require an income of \$25,000 from local or other sources. A library unable to meet this minimum should: (1) limit its objectives and program correspondingly; (2) increase its income by enlarging or reorganizing the area of service and support; (3) procure financial aid from other sources such as the state or federal government.

The achievement of a national minimum of \$1 per capita<sup>a</sup> annually for public library support in all political jurisdictions should be the joint goal of local, state and federal governments. This \$1 per capita figure is determined by the application of average cost figures to the minimum standards of service detailed herein. The following minimum per capita standards of support are recommended for varying stages of development of library service in areas with 25,000 population and over:

For limited or minimum service. \$1.00 per capita  
For reasonably good service. . . . \$1.50 per capita  
For superior service. . . . . \$2.00 per capita

In libraries serving areas with a population under 25,000 the per capita measures should be increased to the \$25,000 minimum income standard of support, or one or more of the alternatives for increasing support mentioned above should be adopted. In other words, for libraries in areas of less than 25,000 population, exact per capita standards of support do not apply. . . .

<sup>a</sup> All financial standards specified in this section are stated in terms of the 1942 value of the dollar.



## MAPS AND CHARTS FOR TOMORROW'S WORLD

By J. CECIL PARKER

Chief, Educational Services Branch, Office of Price Administration, Washington, 25, D. C.

**I**N the months and years immediately ahead, maps and charts will contribute to more effective living through playing an important role in the development of a broader and deeper understanding of the world. To do so, however, those who make and those who use these visual tools of learning must rapidly develop new ideas with reference to them.

The major purpose of maps and charts is to help pupils better to understand the basic physical, political, economic, and social conditions and relationships of the modern world, and thereby to aid them to live more effectively as citizens of the United States and of the world as a whole. It is this major purpose which should be kept continually in mind in designing visual aids and in putting them into use in the school and classroom.

Whatever maps and charts are made and however they are used, there are certain key generalizations which should be kept in mind:

1. *The residents of the United States and of other nations live in "One World" whether the world is at peace or at war. What happens anywhere to peoples or nations directly affects what happens everywhere.*

2. *Modern transportation and communication have made the world "smaller" and more interdependent—in fact the world is "different." The development of international aviation lines and radio channels, for example, has cut across the barriers of space, distance, time, and political boundaries.*

3. *The world is becoming "smaller" psychologically. Members of armed forces are traveling to distant points. Civilians are developing personal interests in remote spots.*

4. *The location, distribution, and utilization of the world's resources of manpower, farm land, forests, minerals, fuels, and factories determine the standards of living and in part the cultures of the world's peoples.*

5. *The full development and use of the human and material resources of the world's nations and the unlimited exchange of goods, services, and scientific and other knowledge can go far toward raising the levels of living, and the health, freedom, and security of the world's peoples.*

### Maps for a New World

The most striking feature of the war period for map makers and users has been the breath-taking advance of aviation, an advance which has far reaching implications for the post-war years. It is estimated that after the war there will be some 300,000 airplanes in the United States alone, 3,000 of which will be commercial aircraft. Airlines to South America, to Europe, to Australia, and to Asia will undoubtedly be even further developed so that within a relatively few hours air passengers and air freight will reach destinations thousands of miles away. In less time than it takes now to make a railroad trip from New York to San Francisco, a traveler by air will be able to



*Courtesy Navy Department*

Only the continents are outlined on this all-black globe, permitting the chalking in of major trade routes and comparative information on continental populations and various resources

reach Rio de Janeiro, Lisbon, Cairo, London, Berlin, Moscow, or Honolulu, Sidney, Singapore, Hongkong, Calcutta.

Many of our nation's schools are now devoting considerable attention to a study of the new world-wide airlines which the United States and its allies have established to further their war effort against the axis. They are interested in the peacetime implications of the effect of these world-wide airlines on concepts of space, time, and distance. Yet teachers of this dramatic subject have been seriously handicapped by the lack of maps adequate to an understanding of the impact of modern aviation on the life of peoples and nations; to the development of realistic concepts of space, time, and distance in tomorrow's world.

All too many schools are equipped solely with world maps based on the Mercator's projection. Such maps, as is commonly known, distort the directions and distances of even the shortest airlines and water routes. For example, a student who learns geography solely from a Mercator's projection has no true concept of the geographic relation between the United States and Great Britain.

What schools need first and foremost is "the perfect map"—a world globe—if pupils are to see clearly and truly the world of the great air and water trade routes that are now being used or charted. As a matter of fact, each school should be equipped with at

least two such globes. One globe should be the usual type which shows the location of the world's land and water masses, of lines of longitude and latitude, of the world's nations and the capitals thereof. It should be free from details which clutter up the globe's surface and interfere with effective study. The second globe should be an all-black type on which only the continents are outlined. This globe can be used to chalk in the major trade routes and comparative information on continental populations and on various resources—petroleum, tin, rubber, and others.

For greatest usefulness, a globe should be as large as possible—for classroom study, say, at least 12 inches in diameter. Although large globes are today much more expensive than the smaller sizes, a school will probably find that this added investment in educational equipment is well worth the price. If the larger-sized globes can be produced in greater quantities for school distribution, it should be possible to reduce net prices.

The well-equipped school, furthermore, should have a carefully-selected stock of classroom-size flat maps. In spite of its limitations, one of these should be a world map on the Mercator's projection. There also should be some polar projections. Sectional maps on some other projections such as the homolosine or conic projections should be included. Other flat maps should portray each of the major continents of the world, preferably showing physical features; national boundaries and major cities; and important rail, highway, and air lines. Some flat maps might well be of the blackboard type covering, for example, the continents of United States, North America, Europe, Asia, and Africa.

In addition to globes and wall maps, a school can profitably utilize an atlas. Such an atlas should contain not only maps showing the physical and political features of a continent or country, but also its major agricultural and industrial characters, its land and mineral resources, and its main lines of transportation and communication.

Schools should increase the extent to which they utilize their own map-making equipment, including wall cloth and simple art materials. With these materials, pupils can make their own maps and illustrate them, to show the particular features and relationships under study.

The educational possibilities of teacher-pupil-made maps can be demonstrated by reference to America's wartime economic problems, particularly the development of understanding of problems, sources, and uses of materials in wartime. During the war period, the economic strength of our nation was seriously impaired by the conquests of the axis powers. Japan occupied and cut off the Malay Peninsula and the East Indies, the source of more than 90 per cent of our raw rubber supply. At one time, German submarines were seriously interfering with our coast-wise shipping of gasoline, fuel oil, and other petroleum products, through their sinking of tankers. Boats formerly bringing quantities of sugar from Hawaii and Cuba were diverted to military shipping. These are the types of facts that pupils might use to show the effects of the war on transportation routes and on America's civilian economy (requiring rationing of automobile tires, for example).



A promising innovation in the display of maps would make use of the still-film projector, both the film-strip or slide and the opaque picture types. The materials thus shown can be prepared by the school itself from maps which appear in newspapers and magazines, or from maps which pupils themselves have made. Or, the slides or film strips for projection may be made available by forward-looking commercial companies. When shown on a screen in the classroom, the teacher and pupils can point out the important features of the map and discuss their meaning.

Not to be overlooked also are the possibilities of teacher-pupil-made pictograph maps and charts. Using outline maps which they themselves have drawn or which have been purchased, pupils can construct maps which show the proportion of the world's population living on the various continents; the production of pig iron, petroleum, coal, or other resources by the major nations of the world; the major water trade routes or the major airlines of the world; the important religious faiths of the world; and the like. For pictures, pupils can use classroom-made or standard symbols such as those available from publishers. These symbols can be cut out and attached to the map.

In developing a better understanding of the United States, pupils can study and make maps and charts showing such features as the following: the distribution of population; the location of coal deposits and major coal-producing areas; the location of iron mines and iron-producing centers; the location of the principal agricultural areas—milk, corn, cotton, cattle, citrus fruits, and truck gardens; the location of the major East-West and North-South rail, water, high-

way, and air lines; the location of the major industrial areas with symbols to show what is manufactured; the outstanding export and import lines with the commodities transported. In connection with these maps, the teacher can point out how the different parts of the United States are dependent upon each other for the production of various goods.

Last but not least, pupils can develop maps and charts which show various aspects of living in their own community. Such maps can show the location of schools, churches, hospitals, fire stations, police stations, the city hall, war price and rationing boards, the business district, the main factories, the residential areas, transportation lines, and so on. Special maps can be made to point out the best, the medium, and the poorest residential areas, giving special attention to the last which usually constitutes a community problem. Other special maps can show the incidence of disease, deaths, crime, fires, also pointing up solutions to these local problems. Still others can deal with traffic flow and accident points, with suggestions as to safety programs. Useful here, of course, are large outline maps of the community on which pupils can portray the situations under study.

#### Charting the Present and the Future

Increasingly schools are beginning to use charts to build understandings of situations and relationships on the part of pupils. As yet, however, teachers depend mainly upon the printed word rather than upon graphic devices to build these understandings. Even when charts are available, teachers often are at a loss as to how best to employ these visual aids in their classroom teaching.

More and more, it is important to note, there are



The pupils of the Chancellor Avenue School in Newark, N. J., constructed this huge world globe under the guidance of teachers of industrial arts and fine arts. It provided a real challenge to all who participated to think of ways in which more adequate expressions could be given to the physical geography of the air world and the social impacts of the use of the air ocean.

good charts ready at hand for classroom study and discussion. Modern textbooks in the social studies contain a wealth of pictorial materials—maps, charts, graphs, and the like. Publications for pupils such as those issued by the Civic Education Press, Scholastic Corporation, and the American Education Press make effective use of charts of one kind and another. *Building America*, a monthly publication on modern problems, also contains a rich variety of illustrative materials, including specially-made picture-charts. The Public Affairs pamphlets likewise have picture-graphs which help the reader better to understand the subject under discussion. Newspapers and magazines, too, are making greater use of picture-graphs and charts as a means of conveying both simple and complex ideas to their readers. Such films as "Victory through Airpower" and many titles prepared for men in the armed services employ animated graphs to show battle and war strategy.

Such charts can be produced commercially and, with the exception of the animated ones, by teachers and pupils on the basis of their research. A few examples indicate what can be done:

1. A circle graph (pie chart) showing how the United States allocated its food supplies in 1943—75% to civilians, 10% to Lend-Lease, 13% to armed forces, and 2% to special needs.

2. A bar graph showing the rise in the incomes received by farmers, and by wage and salary earners in 1939 and 1943—that is, during the war period.

3. A line graph showing the United States' expenditures for military purposes since the attack on Pearl Harbor.

4. A picture-graph showing the occupational distribution of the American people during 1943—those in the armed services; those in industry; those in agriculture; those in the home, etc.

5. Line graphs, properly illustrated, showing the time required to travel by various means (railroad, highway, water route, and airway) between New York and San Francisco—other selected points.

6. A picture-chart showing the distribution of incomes of American families during a recent year.

7. A circle graph showing how a typical American family spends its income dollar.

8. A large chart (illustrated) showing the major federal war agencies and their functions.

9. A large line graph showing what happened to the cost of living during and just after World War I, and during this war to date.

#### Maps and Charts for Tomorrow

The airplane and modern means of communication are changing many practical aspects of time and distance in the world of today and tomorrow. To the rowboat, sailboat, and powerboat we have added the marvels of air transportation and radio communication.

The development of adequate concepts of community living in a world rapidly growing small, both physically and psychologically, will require extensive use of varied types of maps and charts. The possibilities of the future are unlimited. The inscription on the Archives Building in our nation's capital—"The Past is Prologue"—is an appropriate keynote for the production and use of visual tools of learning.



A textbook committee in Chicago carefully checks each sample book submitted for conformation to standard courses of study, quality of authorship and editorial direction, adequacy of subject matter content, organization, method of presentation, etc.

## THE SELECTION AND USE OF TEXTBOOKS

By DON C. ROGERS

Assistant Superintendent of Schools, Chicago, Ill.

**I**RKED by numerous unethical textbook practices and procedures which had grown up through the years, the Chicago Board of Education concentrated (in 1936) all phases of free textbook administration into a Bureau of Textbooks and Building Survey, and insulated this Bureau from all pressures. The head of the bureau (the writer) was sent to New York, Detroit, St. Louis, Baltimore, San Francisco, Los Angeles and other large cities to study their systems of textbook administration.

Some valuable ideas of the business-man president of the board of education,\* supplemented by the study of textbook control in other cities, resulted in a comprehensive system of textbook administration for Chicago which included an inventory of more than five million books, the purchase of books by competitive bidding, the employment of book-auditors, the operation of a depository, a bindery, a sample library, —and techniques for the selection and use of textbooks. An interesting story could be written about each of these phases but this article deals only with the selection and use of textbooks.

### Selection of Books by Committees

The selection of books to be included on the official

Approved Textbook List, is made by twenty-four subject committees in arithmetic, English, music, penmanship, reading, science and health, civics and safety, geography, history, and spelling for the elementary schools, and similar subject committees for the high schools. The District Superintendents nominate principals and teachers trained in the special subjects and known to be doing effective work in them, for membership on the subject committees. From the list of nominees, the superintendent of schools\*\* appoints the committees, each of which consists of a principal as chairman, and four teacher-members. Their names are announced in the Superintendent's Bulletin. Twice a year, the committees meet in the Bureau of Textbooks and Building Survey to evaluate newly-published texts.

### Submission of Samples by Publishers

Prior to these semi-annual committee sessions, all textbook publishers of record are notified that they may submit a sample copy of each new book if they wish to have it considered for possible placement on the next approved list. Formerly, publishers complained of the "sampling evil" and the abuse of the "desk copy" practice. Now they are informed that

\* Hon. James B. McCahey.

\*\* Dr. Wm. H. Johnson.



they need furnish only one sample copy (actually, most publishers provide a copy for each committee member). The Bureau of Textbooks and Building Survey maintains a Sample Library where all approved textbooks are available for examination, and desk copies can be provided from the depository.

The publishers are asked to fill out a brief questionnaire for each sample submitted, giving exact title, author, subject, grade level, copyright date, regular net wholesale price, and any written comments about special features. After the sample copies are received and classified according to subject, the committees are called into session. They do not hold hearings. However, every book is given an intensive examination covering all phases, such as the quality of its authorship and editorial direction, adequacy of the subject-matter content; organization and method of presentation; conformity to standard courses of study (not just Chicago's courses of study); physical manufacture and composition including binding, kind and size of print, color illustrations, quality of paper, and others.

#### Criteria for Textbook Selection

A total of 35 criteria are applied to each book through use of a "Check List for Evaluating Textbooks." This check list was developed at a conference of committee chairmen with the technical counsel of a professor of education at Northwestern University.\*\*\* The committee gives each criterion a mark of A, B, C, D, or E and sums up the total rating of the book with one of these letter values. (Note: Only A- and B-rated books appear on the final printed approved list.) All the committee members sign the check list, even for rejected books, and these sheets are filed away, together with committee notes, for possible future reference. (Note: It is difficult for a publisher or an author to believe that whim or bias did not operate in the case of a rejected book.)

#### Purchase and Management

When the committees have finished their work, the titles of the surviving books are compiled into a printed Chicago Approved Textbook List which is officially approved and adopted by the superintendent of schools and the board of education. Similar approved lists are prepared for maps, charts and globes, periodicals, work materials and tests, and for elementary school library books. From the textbook list alone, Chicago purchases nearly a million books per year, under a system of competitive bidding involving large-quantity deliveries to the depository. Once each semester, the schools requisition books from the Textbook Depository, using a printed requisition of the check list type. Some of these books are standard editions but frequently they are special and split (or semester) editions—but that, too, is another story.

#### The Use of Textbooks

The use of textbooks is such a broad subject that only typical examples can be presented. Chicago has the adoption system for the more precise subjects. For example, although there may be eight or ten arithmetic series for grades 3-8 on the approved list, the board of education contracts for only one which all schools use.

\*\*\* Professor William Brink.

## CHECKLIST FOR EVALUATING TEXTBOOKS

### CRITERIA FOR EVALUATION

#### I. *Is the content of the textbook satisfactory?*

1. Is the material in harmony with the environmental and present-day needs of the child?
2. Is the material in harmony with accepted educational aims?
3. Is the material attractive and stimulating to the pupils?
4. Is the language used adapted to the age and maturity of pupils?
5. Is the content well graded?
6. Are there sufficient details to give meaning to the main topics?
7. Is the material accurate in fact and illustration?
8. Does the material cover the field with respect to the grade level of the child?
9. Does the material present a wholesome picture of the American way of life in our democracy?

#### II. *Is the material of the textbook well organized?*

1. Is the material organized in a psychological rather than a logical manner?
2. Is the principle of relative values adequately emphasized?
3. Are essentials clearly differentiated from non-essentials?
4. Is the material organized in such a way as to permit correlation with other subjects?
5. Is the material arranged so that parts may be omitted without impairing the cumulative effect?
6. Is the arrangement of main divisions and details satisfactory?
7. Does the organization of the material take into account the variability of pupils' interests and abilities?
8. Are practice exercises well placed?

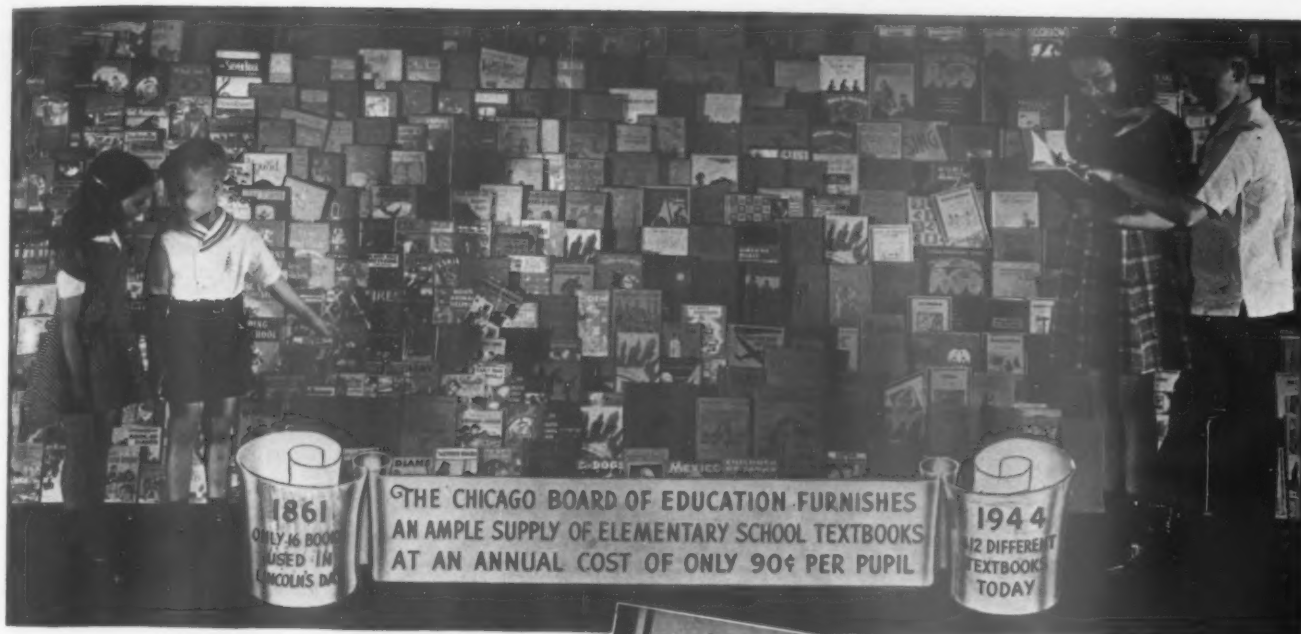
#### III. *Does the book contain adequate instructional aids?*

1. Are the illustrations, maps, sketches, tables, and charts adequate, interesting, and educationally useful?
2. Does the book help the student to help himself by means of thought-provoking questions and directions?
3. Is the meaning and pronunciation of unusual and difficult words given by means of a glossary or otherwise?
4. Is the drill material simple, varied, and well graded?
5. Is the index full and usable?
6. Are there definite, annotated, and evaluated references?
7. Is there an informal, provocative, and interesting introduction for pupils?
8. Is the table of contents full and usable?
9. Are the chapter and section headings clear, brief, and interesting?

#### IV. *Are the mechanical features of the textbook satisfactory?*

1. Is the paper of good quality?
2. Is the typography suitable to the grade for which the book is intended?
3. Is the binding of the textbook durable?
4. Are the illustrations placed close to the text illustrated?
5. Is the set-up of the headings good?
6. Is the appearance of the book attractive?

Is the Textbook as a Whole Satisfactory?



On the other hand, a quite different plan is used for reading. In grades 1-3 there are four basically-adopted reading series (each consisting of readiness, preprimer, primer, grade 1, grade 2, and grade 3), plus two auxiliary or supplementary series, plus several dozen unit study booklets, plus several hundred library books, plus work books, plus reading achievement tests. In grades 4-8 there are two basically-adopted reading series, one of which is of the work-skill type and the other of the literary appreciation type, plus innumerable collateral materials.

In the high schools, certain subjects have a single basic textbook, e.g., shorthand, typewriting and a few others. In the case of high school English, there is a basic composition and grammar textbook used in semester editions, a basic anthology split into semester editions, and scores of special literature books and classics. In addition to these, Chicago's high schools have a third of a million library books, or an average of 8,000 per school.

An interesting innovation is the preparation of lists of 75 English literature books carefully selected according to grade level, vocabulary, interest, and other

features by a special committee. These books are being introduced into the high school English courses in sets. The sets for the ninth grade were put into use in 1943; the sets for the tenth grade will be provided in 1944; and sets for the eleventh grade in 1945.

#### Growth in Textbook Material

In 1861, the board of education rules restricted Chicago pupils to 16 textbooks for grades 1-8 and 46 textbooks for all high school subjects, a total of 62 for all grades—and the parents purchased the textbooks. The rules stated that these, "and no others," might be used by the teachers.

In 1944, textbook materials are available for requisition by the principals and teachers as follows: nearly a thousand different textbooks; more than three thousand elementary library books, and unlimited choice of high school library books; twenty-five elementary periodicals, and more than three hundred periodicals for use in high schools; more than five hundred work material and test titles; and almost two thousand different maps, globes and charts. All of these are furnished free to today's students.



# THE AMERICAN TEXTBOOK PUBLISHERS INSTITUTE

By LLOYD W. KING

Executive Secretary

The American Textbook Publishers Institute

ONE of the significant developments in education during the year has been the formation and functioning of the American Textbook Publishers Institute. It is an association of textbook publishing companies in the United States organized for the following purposes:

To promote better understanding by the public of the place and the need of the textbook in American education.

To increase the public service rendered by the industry.

To cooperate with educational authorities and with groups of citizens interested in education in stressing financial support for education.

To cooperate with educational authorities in educational planning.

To assist in gearing industry to the war effort.

To stimulate research on textbooks and teaching problems directly affecting the use of textbooks.

To provide a clearing house of ideas, suggestions, and recommendations made by educators and by publishers pertaining to the more effective use of textbooks.

To help the industry in its postwar planning.

To bring to focus the problems and needs of the industry in these critical times to the end that adequate services might be continued to the schools of the nation.

## Membership

The Institute does not effect a combination of company members for the purpose of price control, nor does it in any way break down competition in the textbook publishing field. It does not destroy the individuality of member companies, nor infringe on their individual programs and policies. However, it does offer an opportunity for the improvement of trade practices within the industry.

At the present time the following companies are members of the Institute:

The Bobbs Merrill Company  
Encyclopaedia Britannica  
F. E. Compton and Company  
The Economy Publishing Company  
Ginn and Company  
The Gregg Publishing Company  
E. M. Hale and Company  
Harcourt, Brace and Company, Inc.  
Harper & Brothers  
D. C. Heath and Company  
Henry Holt and Company  
Houghton Mifflin Company  
Laidlaw Brothers  
Lyons & Carnahan  
The Macmillan Company  
McCormick-Mathers Publishing Co.  
McGraw-Hill Book Company, Inc.  
Mentzer, Bush and Company  
Charles E. Merrill Company



The author, Mr. Lloyd W. King

Newson & Company  
Prentiss-Hall, Incorporated  
The Quarrie Corporation  
Rand McNally & Company  
Row, Peterson & Company  
William H. Sadlier, Inc.  
Benj. H. Sanborn & Co.  
Scott, Foresman and Company  
Silver Burdett Company  
L. W. Singer Company  
The Steck Company  
The University Publishing Company  
D. Van Nostrand Company, Incorporated  
Webster Publishing Company  
John Wiley & Sons, Inc.  
The John C. Winston Company  
World Book Company

## Management

All publishers of school books in America are entitled to membership in the Institute upon payment of the annual dues.

No member may receive or be entitled to receive any pecuniary profits or dividends from the Institute, and all funds of the Institute are to be devoted wholly to the furtherance of its objectives.

The management and direction of the Institute is vested in a board of directors consisting of nine members, three of whom are elected at each annual meeting to serve a period of three years.

The following constitute the board of directors:

Edward H. Kenerson, Director	President
Ginn and Company	
Statler Building	
Boston, Massachusetts	

R. C. McNamara, President Scott, Foresman and Company 623 South Wabash Avenue Chicago, Illinois	First Vice President
W. P. Johnson, President Webster Publishing Company 1808 Washington Avenue St. Louis, Missouri	Second Vice President
James G. Stradling, Vice President The John C. Winston Company 1006 Arch Street Philadelphia, Pennsylvania	Secretary
Burr L. Chase, President Silver Burdett Company 45 East Seventeenth Street New York, New York	Treasurer
Murray N. Parker, President Benjamin H. Sanborn and Company 221 East Twentieth Street Chicago, Illinois	
George P. Brett, Jr., President The Macmillan Company 60 Fifth Avenue New York, New York	
J. W. Prater, Vice President Houghton Mifflin Company 2500 Prairie Avenue Chicago, Illinois	
Dudley R. Cowles, President D. C. Heath and Company 285 Columbus Avenue Boston, Massachusetts	

The following members of the board of directors serve as the executive committee of the Institute:

Edward H. Kenerson	R. C. McNamara
James G. Stradling	Burr L. Chase
George P. Brett, Jr.	

Lloyd W. King, for some years State Superintendent of Schools and Director of Vocational Education for Missouri, serves as Executive Secretary. The executive offices of the Institute are located at 150 Fifth Avenue, New York, New York.

The American Textbook Publishers Institute represents over 85 per cent of the industry. For a long time the members have thought that they should have an official representative of the industry who could work cooperatively in the name of the industry with educators and lay groups in furthering education, because the companies realize as education is advanced their industry advances.

#### Problems of the Industry

The textbook publishing industry faces many problems at this time:

1. The war has brought acute material shortages. A reduction in paper allotments, shortages of binding material, shortage of manpower have all contributed to making perplexing the administration of the industry.

2. The boys and girls of the nation's schools are not given an adequate supply of school book material. A relatively small part of the educational dollar is used for the purchase of books. Between one and two

per cent of the expenses for school purposes is used for textbooks.

3. The industry received occasional unjust criticism, because of unintelligent buying on the part of school authorities. The Institute hopes to encourage not only intelligent buying, but also the intelligent use of textbooks.

#### Activities of the Institute

The Institute is engaged at the present time in an interesting and varied program of activities:

It is encouraging research on a survey of materials dealing with Latin-America in the United States textbooks on the elementary, high school, and college levels.

It is working through various advisory committees with governmental agencies to help gear most intimately the whole industry to the war effort.

It is organizing the whole industry for post-war planning.

It is cooperating with various governmental agencies in making possible the publication, on a competitive basis, of materials which influence the war programs of education. The production of the pre-induction training textbooks is an example of the Institute's activity in this area.

The Institute works intimately with the Armed Forces Institute in making possible the production of needed textbook materials for the members of the armed forces.

It is setting up discussion groups and programs with educators in an attempt to secure from educators their best thinking with reference to ways in which the textbook industry may best serve education.

It is sponsoring publication of educational articles on various aspects of the textbook problem.

#### Will Work for Advancement of Education

School authorities are asked to support the Institute and its objectives. The textbook publishing industry has been a vital factor in education in the United States. It needs the understanding of, the interpretation through, and the guidance by educational authorities in order that it may be of maximum service to the schools of the nation.

Citizens who are interested in the nation's schools are urged to understand the essentialness of the textbook publishing industry, and to provide adequately the schools with textbook material.

Publishers of school books are urged to join in the effort to stimulate the program of research and service on the part of the whole industry.

The textbook publishers of the nation are justly proud of the contribution they have made to education. In these critical times they desire to continue to be of the greatest service in the prosecution of the war, and in the days that lie ahead the industry covets the opportunity to work most intimately with the educators of the country to the end that it can be of greatest service in making the work of the schools most effective.

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Playground Apparatus  
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*"Betterbilt"*

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Superior for regular school service plus extra war needs. Present conditions demand many new uses of school facilities. In all emergency table needs, Red Cross work, civilian registration, etc., Fold-O-Leg Tables can be quickly put into service and as quickly put out of the way. Whether for emergency work, study halls, cafeterias, vocational schools, for banquets, etc., your table problems will be solved by the all-purpose Fold-O-Leg Table.



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6. SANITARY BARN EQUIPMENT

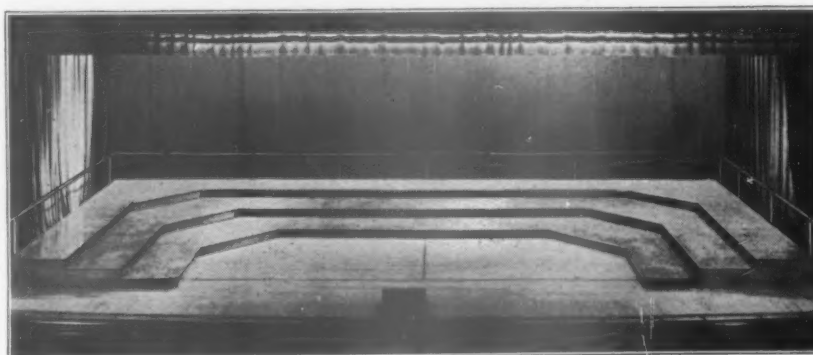
## FOLD-O-LEG TABLES

provide all the sturdiness of a stationary type table, plus streamlined beauty, and folding convenience. The set-back design of legs provides 25% more seating capacity in greater comfort. Easily and quickly set-up, legs lock securely in place automatically and are quickly released. Hardwood legs fold into top, saving 300% in storage space, plus handling ease and man-power savings.

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Colorado State College Greeley, Colorado	Board of Education Ferndale, Michigan	Washington High School Milwaukee, Wisconsin	Villanova College Villanova, Pennsylvania
Yale University New Haven, Connecticut	Sarah Lawrence College Bronxville, New York	Watsonville Union High School Watsonville, California	Bratenahl School Brighton, Ohio
Sterling Morton High School Cicero, Illinois	St. Joseph's Academy Mc Sherrystown, Penna.	Morgan Township School Valparaiso, Indiana	North Division High School Milwaukee, Wisconsin
Elkhart High School Elkhart, Indiana	John Adams High School South Bend, Indiana	LaSalle-Peru Twp. High School LaSalle, Illinois	Wheaton College Wheaton, Illinois

THE AMERICAN SCHOOL AND UNIVERSITY—1944



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The Clarin chair has the stability, finish and attractiveness of built-up furniture. Its automatic positive lock allows it to be moved about with never a thought of its being a folding chair, yet it may be quickly folded for "out-of-the-way" storage or transportation. It has a full 16-inch seat and meets every safety regulation.

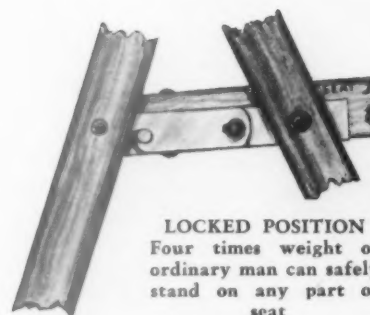
When you examine the Clarin chair closely, its strength is apparent, and the satin-like finish is assurance of its freedom from catchy slivers or corners so destructive to fabrics. It's a chair that is not out of place anywhere. As for comfort, sit in it for an hour or more and you will recognize it as an achievement in folding chair design.

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# RADIO CORPORATION OF AMERICA

EDUCATIONAL DEPARTMENT, RCA VICTOR DIVISION

Camden, New Jersey

## RCA AUDIO AND VISUAL TEACHING HELPS



**T**ODAY, the finest endorsement of RCA Audio-Visual aids to instruction is their extensive use by our armed forces to help train vast numbers of men in the shortest possible time. The motion pictures and other Audio-Visual teaching aids being employed to accomplish that job have given a mighty good account of themselves. Time required for training has been shortened in many instances by as much as 40%.

Naturally, war production is the paramount job of RCA until final victory is won. That's why, today, we cannot furnish many of the materials and equipments which schools need. We regret this, of course, but in the meantime, we hope this section may be of assistance to you in planning for the future. In addition, we shall be ready to provide advisory assistance concerning the most suitable equipment for specific situations. There will be no charge or obligation and all inquiries will receive prompt attention. Simply address: —The Educational Department, RADIO CORPORATION OF AMERICA, Camden, New Jersey.

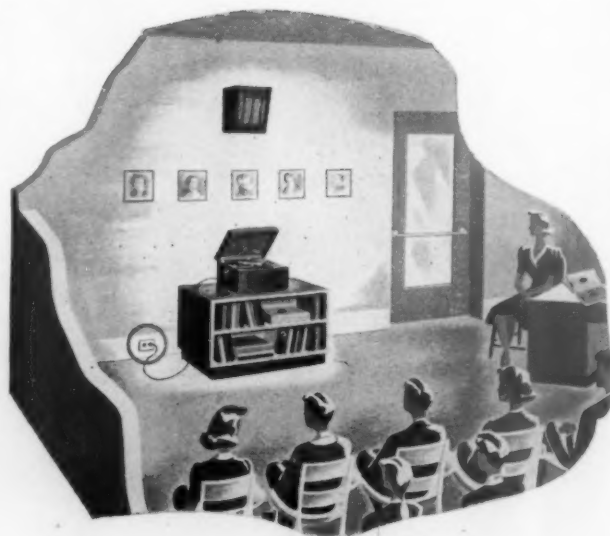
## RCA CLASSROOM PHONOGRAPHS AND RADIOS

**G**REATER attention will undoubtedly be given to the phonograph and radio requirements of schools in the post-war era. RCA Victor is continually conducting research to determine the usefulness of new models which will be made available as soon as their practicability has been established. At the same time standardization of school models of such equipment will be achieved wherever possible to make possible maximum economy and efficiency.

The type of RCA phonograph selected should have a minimum output of 3 watts, depending upon the size of the room and the number of students in the class. A small storage cabinet should be provided for storing at least fifty records to keep them free from dust and prevent breakage. Phonograph records should always be stored vertically.

The number of phonographs necessary in the Elementary School will depend on the general arrangement of the building. Not more than three teachers should attempt to use the same phonograph, and these teachers should have adjacent rooms on the same floor.

High school teachers are more specialized in their particular fields, and accordingly, plans should be made to provide each teacher in history, literature, speech, language, and music with a suitable phonograph and selection of records. A cabinet for proper storage of records is also essential.





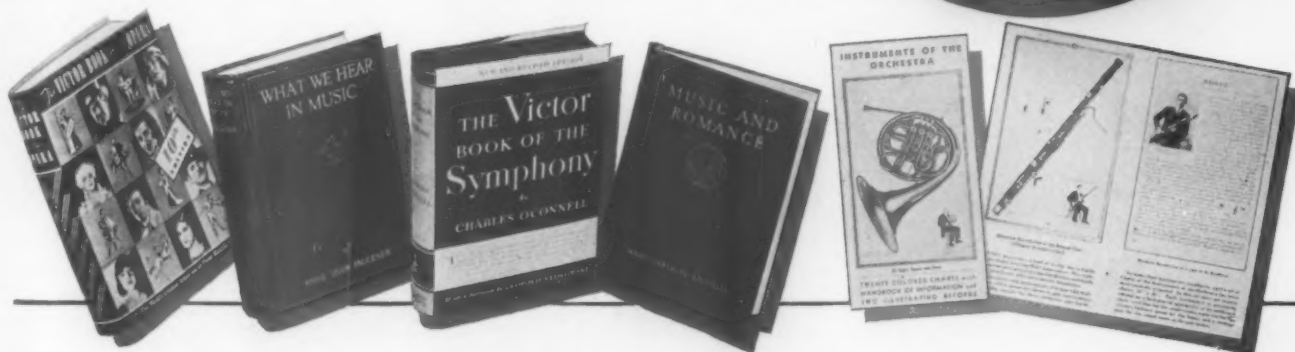
## VICTOR RECORDS FOR SCHOOLS

A BACKGROUND of 33 years of experience in developing Victor Records for use in thousands of schools has given the Educational Department of the Radio Corporation of America a thorough knowledge of record requirements for the teaching of music, music appreciation, and many other subjects.

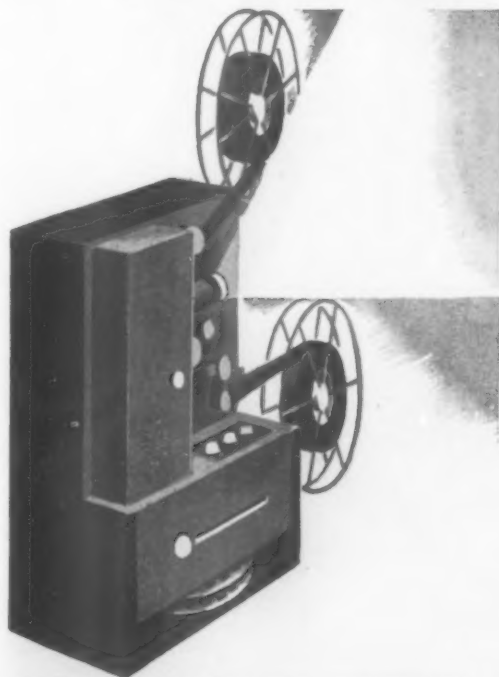
Today, in practically every field of learning, from kindergarten through college, Victor Records are being used to quicken the interest and broaden the knowledge of millions of pupils.

### RCA TEXT AND REFERENCE BOOKS

The text and reference books pictured below have been published to provide more information regarding the broad field of music, and thousands of Victor Records have been issued in connection with these and many other music text-books. Accordingly, there is scarcely a city, town, or village school in the entire United States which does not use Victor Records in one or more phases of its educational program.



## IT'S RCA "FOR THE BEST IN 16 MM."



SINCE all production of RCA 16mm. sound projectors is being absorbed by the armed forces today, there are no new RCA projectors available, but thousands now in use continue to prove their rugged endurance, ease in operation and excellent projection of both image and sound.

After victory, you will want to consider the RCA 16mm. projector for your school because of its many outstanding advantages and moderate cost.

Remember, the experience gained by RCA in the development of high-fidelity radio transmitters and receivers...and in providing projectors and sound system equipment for motion picture theatres throughout the world...has been of inestimable value in achieving the superior design and construction of RCA's famous 16mm. Sound Motion Picture Projector.

The simplicity in design of the RCA 16mm. projector makes it possible for the amateur operator to secure projection and sound reproduction that compares favorably with the best professional standards.

When choosing any motion picture or sound equipment, a most important point to be considered is the question of service facilities. When you choose an RCA 16mm. Sound Motion Picture Projector, you may rest assured that complete and competent service facilities will be at your command in all sections of the United States.

## FM TRANSMITTERS AND RECEIVERS BY RCA



**F**M (frequency modulation) radio, first introduced in 1938, has proved itself to be the most practical type of radio for most school systems.

Already, several big city school systems have FM Transmitters, and there is literally no limit to the educational advantages of radio when the broadcasting can be controlled within the school and the school system.

Here, for example, is a recently compiled list of a few important FM uses: news and current events programs adapted for various age levels; subject motivation programs; Supplementary Aid programs; story-telling; guidance programs; library programs; talks by prominent guests; In-service Teacher training; adult education programs; music for special activities; announcements; Student Talent programs; forums and discussions; sports; community cooperation programs.

RCA has been and will continue to be a leader in the development of FM transmitters. That's because RCA engineers have more experience in building (and operating) radio transmitters than any other group. Furthermore, RCA has always pioneered in the development of high frequency antennas and is now building many models for the armed services.

While the war has stopped production of FM transmitters and receivers for civilian use, those connected with school management will certainly want to consider the possibilities of an FM installation in the post-war era.

## RCA TRIUMPH! THE ELECTRON MICROSCOPE

**M**ICROSCOPIC worlds heretofore unseen have been opened up by the RCA Electron Microscope. Using electrons instead of light rays, and electro-magnetic fields instead of glass lenses, this amazing instrument is from 50 to 100 times more powerful than the strongest optical microscope. A dime thus magnified would appear more than a mile in diameter, a human hair would be seen as large as a giant redwood tree.

Already, the Electron Microscope has contributed vital new knowledge to researchers in chemistry, metallurgy and biology. It is helping to combat disease in humans, animals and plants... helping industry develop vastly improved products in order that life may be richer and more interesting.

Considering its well-nigh unlimited possibilities as a research instrument, it is only natural that the RCA Electron Microscope is being set up in many of our educational institutions almost as a course of its own, but closely cooperating with the chemical, biological, physical and metallurgical branches to obtain maximum flexibility and coordination between operation, application and results.

Thus, the electron microscope has been able to open new unseen worlds far into the sub-microscopic realm. In doing so, it has become not only a powerful new tool of science and industry in general, but also an instrument of great value to education.



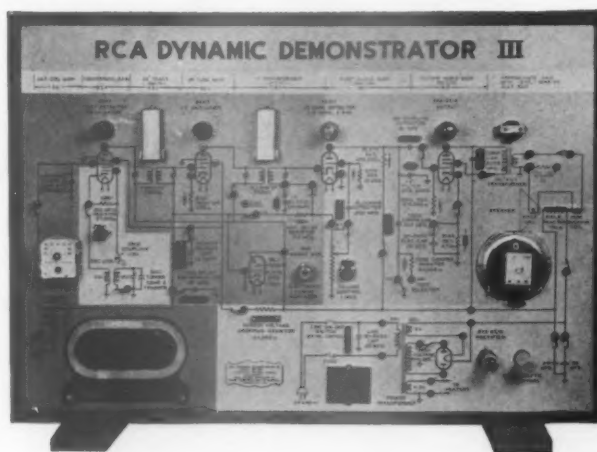
## RCA TEST AND DEMONSTRATOR EQUIPMENT

As the field of radio-electronics rapidly expands under the impetus of war, there is a corresponding increase in the need for trained personnel. This situation has called for the development of special training devices. In order to provide the most effective tools, RCA has designed a number of teaching instruments, headed by the Dynamic Demonstrator, which play an important part in the training of technicians.

Detecting the causes of radio performance variations and indicating the necessary corrections are the essential functions of the instruments. The Dynamic Demonstrator, for example, is in reality a five-tube radio set spread out on a board suitable for classroom viewing. The surface of the board is printed with a typical schematic diagram of the five-tube set.

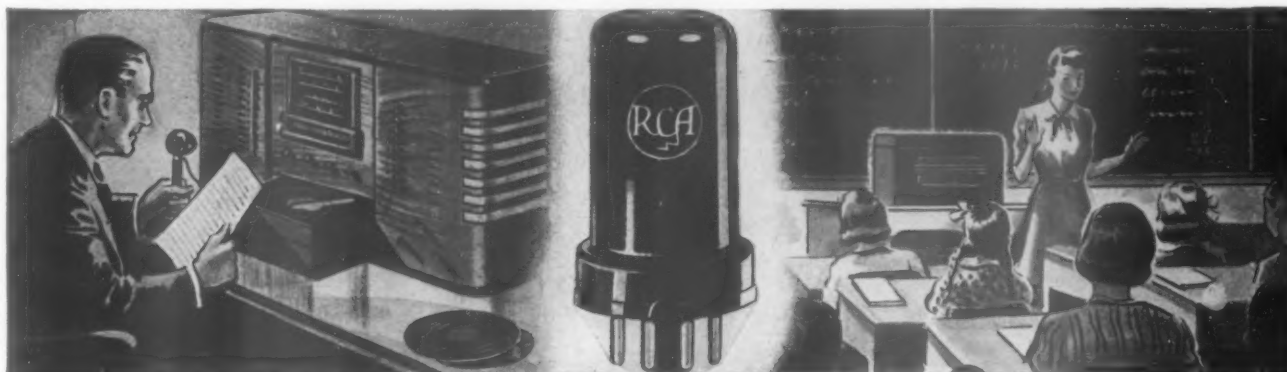
Next to each symbol, the actual corresponding part has been mounted on the board. The parts in turn are inter-connected behind the board, thus enabling the whole radio set to operate. Important voltage measuring points, as indicated by the schematic diagram, are available through pin jacks for electrical testing.

By using this Dynamic Demonstrator, a student can, within a very short period of time, form a mental picture of the logic behind radio receiver construction. It will serve as a basis for the study of far more complicated receivers and radio principles. Many assorted pieces of test equipment can be employed in conjunction with the Dynamic Demonstrator to further analyze how each circuit functions.



*The RCA Dynamic Demonstrator gives a quick picture of the design of a radio receiver.*

Other RCA test equipment includes the RCA Cathode Ray Oscilloscopes; the RCA Junior VoltOhmyst; and the RCA Rider Chanalyst.



## RCA TUBES AND TUBE INFORMATION

RCA Tubes are the very brain of RCA electronic equipment for schools, including radios, sound systems, television, phonographs, recording equipment and test equipment...dependable beyond question. Expertly engineered by men to whom "electronics" was a by-word more than a decade ago, RCA Tubes are

produced by modern quantity methods which assure high quality at low cost. RCA Tube Information includes new tube announcements, manuals, bulletins, handbooks and other literature of special interest to teachers and students in which electronic principles are presented and electronic equipment explained.



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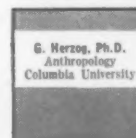
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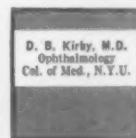
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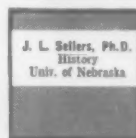
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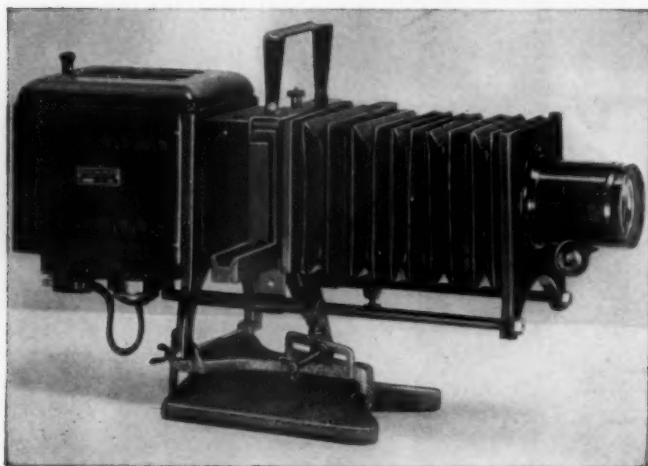
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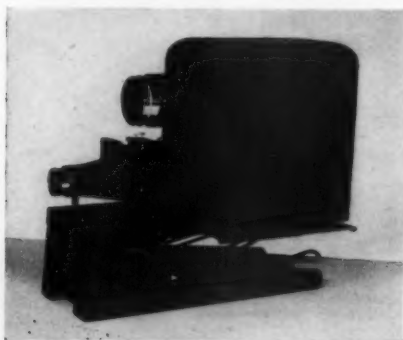
## BDT BALOPTICON—For Slides Only

This extremely popular model is inexpensive, sturdy in construction, compact, easily portable and highly efficient. Its optical system is of exceptionally high quality and (depending on the lamp and lens used) can be used at distances from 4 to 80 feet from the screen. Image sizes range up to as large as 10 feet on the longer side. Maximum illumination. Extremely simple to operate. Still film, micro-projector and overhead projector attachments are available. The sturdy, tilting base is adjustable in two meridians and permits leveling the Balopticon even when placed on an uneven surface. This mounting allows for changing the projection angle for screen at various heights.

Model B is the same instrument as the BDT but without the tilting base. It is recommended for use where a permanent installation is being made, although it is readily portable.

## LRM AND ERM BALOPTICONS FOR OPAQUE OBJECTS AND LANTERN SLIDES

The new ERM and LRM Balopticons for lantern slides and opaque objects give brilliantly sharp screen images under actual classroom conditions. An improved Built-In Blower-Cooling System safeguards efficiently objects being projected. The improved object holder is entirely free from interfering obstructions and permits projection of 6" x 6 3/4" areas of large maps, drawings or photographs. The door is arranged



for convenience in placing solid objects in the projection area.

## SEND FOR CATALOGS

Catalog E-11, "Balopticons and Accessories," completely describes our line of Balopticons, many of which were omitted here due to lack of space. Micro-Projectors for school and college use are the subjects for Catalog E-20. For information on Bausch & Lomb Microscopes and Spectographs see page 326 of this book.

THE AMERICAN SCHOOL AND UNIVERSITY—1944

## B&L 2" X 2" SLIDE PROJECTOR

Manufactured to the high standards of performance that characterize all Bausch & Lomb projection equipment, the performance of the B&L 2" x 2" Slide Projector is characterized by brilliant, crisp, sharply defined screen images plus comfort, safety and convenience in operation. Shows black and white or color transparencies. An ideal instrument for showing slides made by the instructor or by the students themselves.

This projector is substantially made and is fitted with a high efficiency Bausch & Lomb optical system. This consists of a 150 watt, single contact base bulb with a silvered, concave reflector, a triple lens condenser, one lens of which is special heat absorbing, and a five-inch f: 3.8 B&L Cinephor Projection Lens of the same type as used in professional motion picture projectors. Slide carrier permits use of cardboard, metal or glass mounted slides.

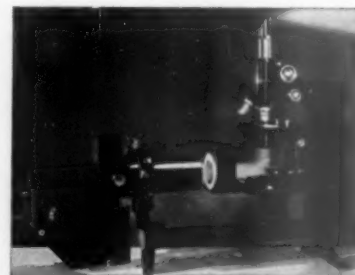


## MODEL B MICRO-PROJECTOR

Now Bausch & Lomb offers a new Micro-Projector at a new low price. Any standard compound microscope can be used.

Simply place the microscope on the stage of the projector in an upright position, apply the prism reflector cap to the microscope and focus the illuminator. Complete directions accompany each projector.

Investigate this new instrument before completing your plans for science laboratory development.



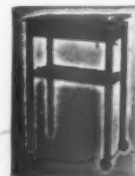
## TRIPLE-PURPOSE MICRO-PROJECTOR

Especially designed and priced for high schools, this extremely efficient unit serves three definite purposes—(1) projection of permanently mounted specimens on a screen from 4 to 15 feet away. (2) making drawings of microscopic fields. (3) projection of living specimens in liquids. Exceptionally sturdy in construction. Has both coarse and fine focusing adjustment. A two-power projection lens is included.



## BALOPTICON TABLE

The B&L Balopticon Table provides a means of placing a Balopticon where it can be used to best advantage. It is portable (rollers on two front legs), and has a shelf underneath for slide boxes.





# SPENCER LENS COMPANY

Buffalo, New York

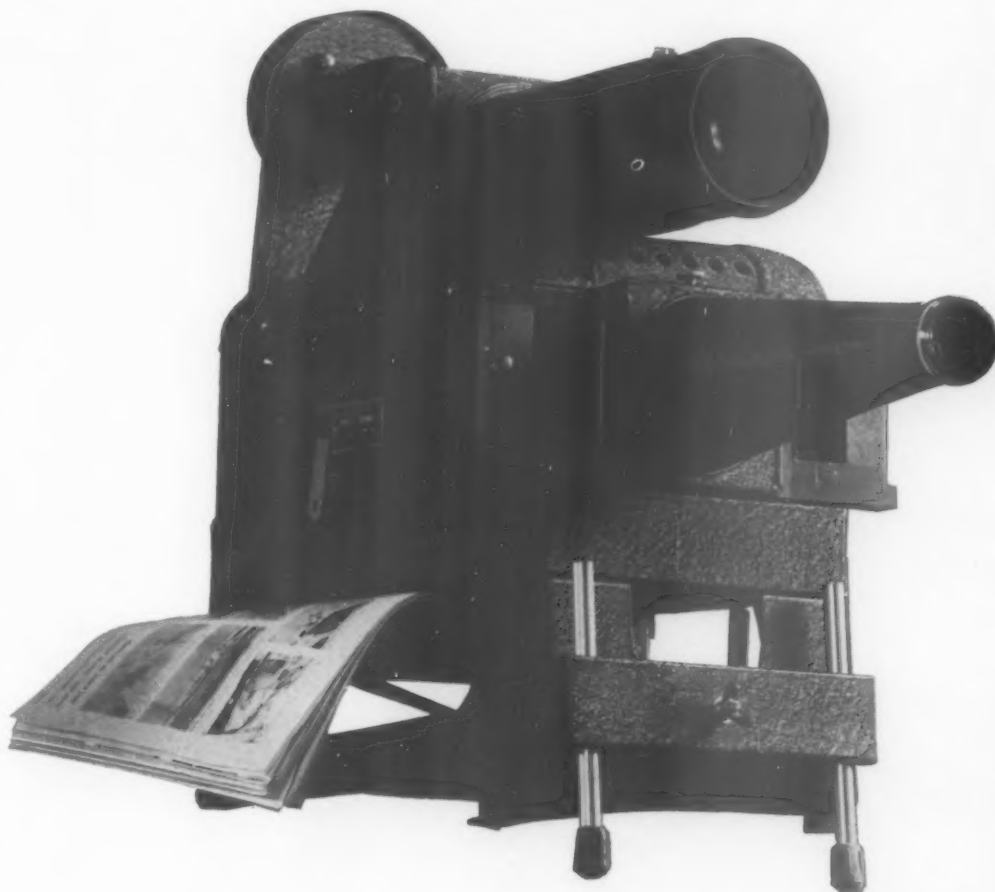


Manufacturers of

Microscopes—Microtomes—Optical Measuring Instruments  
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## Spencer Model VA Combination Classroom Delineascope

Wartime's impressive use of projection equipment—in educational institutions and training schools, in Army, Navy and Air Corps operations—re-emphasizes the well-known practical value of visual educational methods.

During the war Spencer's greatly expanded facilities are taxed to the utmost in producing the large number of Delineascopes needed by the Services.

*When the world is again at peace, a greater Spencer organization will be ready to serve you*

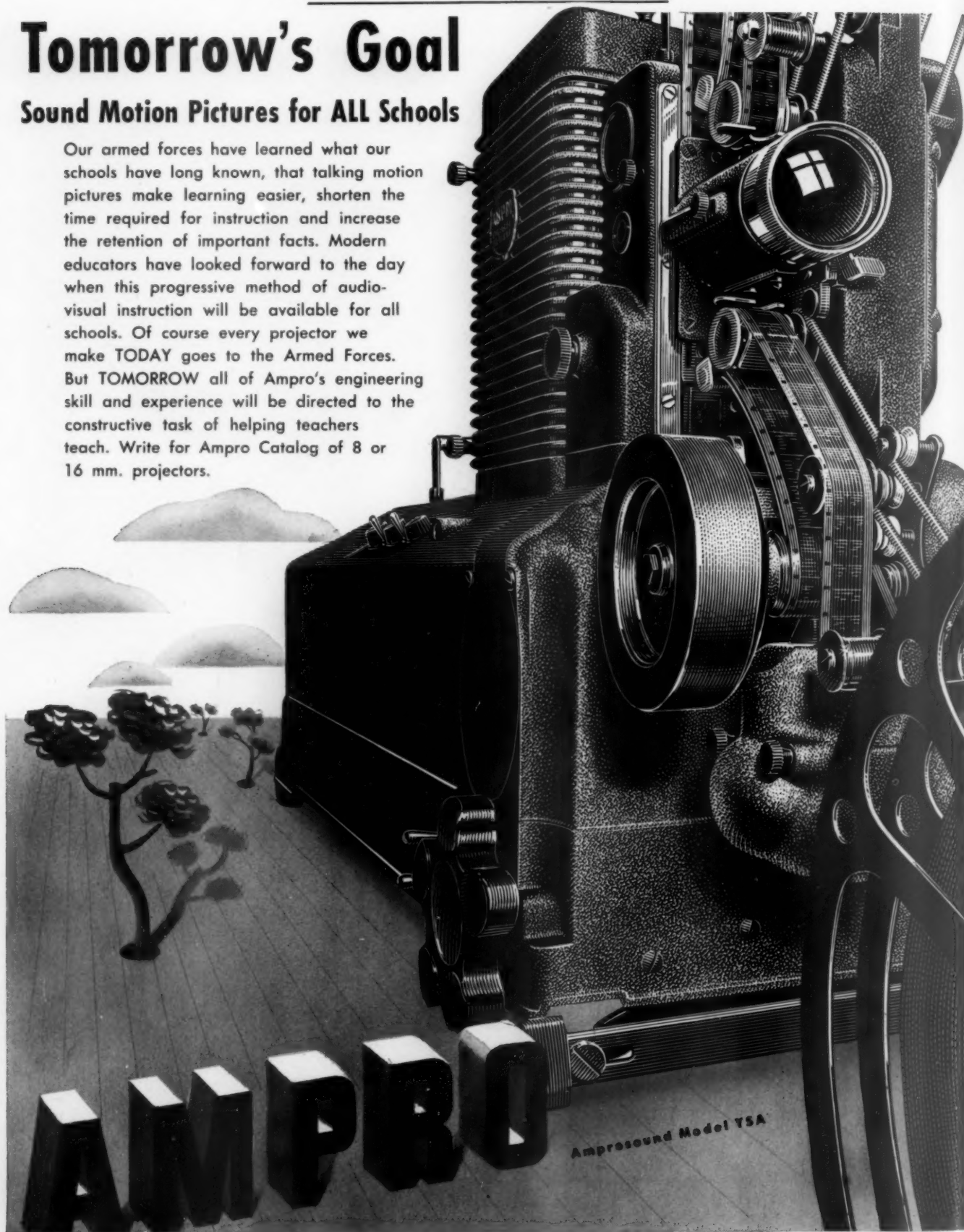
## AMPRO CORPORATION

2851 N. Western Avenue, Chicago, Ill.

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## Sound Motion Pictures for ALL Schools

Our armed forces have learned what our schools have long known, that talking motion pictures make learning easier, shorten the time required for instruction and increase the retention of important facts. Modern educators have looked forward to the day when this progressive method of audio-visual instruction will be available for all schools. Of course every projector we make TODAY goes to the Armed Forces. But TOMORROW all of Ampro's engineering skill and experience will be directed to the constructive task of helping teachers teach. Write for Ampro Catalog of 8 or 16 mm. projectors.



THE AMERICAN SCHOOL AND UNIVERSITY—1944

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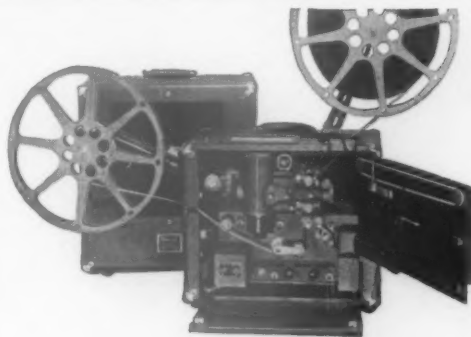
WASHINGTON, D. C.

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*Manufacturer of FILMO and FILMOSOUND  
Educational, Professional, and Personal Motion Picture Equipment  
Operators of the Filmosound Library of Sound and Silent Films*



The Filmosound V... — is a B&H engineering achievement which maintains high performance standards despite restrictions of critical materials. It is now produced only for the armed forces.



### Pupils learn more in less time

Research proves that pupils of every age group learn far more in less time . . . when regular classroom methods are augmented by motion pictures. And under the *dual* impression of sight and sound, students *retain* more of what they learn.

There's no finer reason for making the fullest use of your school projector. Subject matter is never a problem, for the Filmosound Library is . . .

### A TREASURY OF TEACHING HELPS

Thousands of professionally made films are ready for your use. Each one has been evaluated for its application to teaching or entertainment. Subject matter is almost unlimited. And to help you choose the right film for your specific purpose, we have prepared the B&H Educational Utilization Digest, a guide chart which shows, at a glance, a film's adaptability to classroom subjects and to age groups.

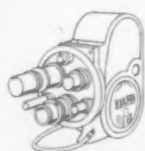
Write to us for this helpful book and for a complete Filmosound Library catalog.

\* Opti-onics is OPTics . . . electrONics . . . mechanICS. It is research and engineering by Bell & Howell in these three related sciences to accomplish many things never before obtainable. Today Opti-onics is a WEAPON. Tomorrow, it will be a SERVANT . . . to work, protect, educate, and entertain.



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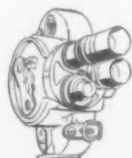
### THESE WILL AGAIN HELP YOU TEACH YOUNG AMERICA . . . AFTER VICTORY



Filmo Aristocrat  
8 mm. Camera



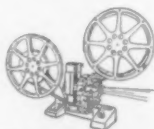
Filmo Master "400"  
8 mm. Projector



Filmo 70-D 16 mm.  
Camera



Filmo Master 16 mm.  
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Filmo Showmaster  
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### Be sure your Filmo Projector is in perfect condition

Projectors are weapons today. All we make go to the armed forces. Yours must be kept in good repair. Take it to your B&H dealer. He can give you standard costs on the repairs needed and will help you pack it for safe shipment to the factory.

**BUY WAR BONDS**



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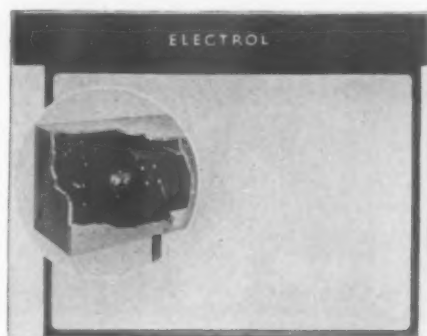
# DA-LITE SCREEN COMPANY, INC.

Dept. 44ASU, 2723 No. Crawford Ave., Chicago 39, Ill.

*Quality Screens for 34 Years*

## Sizes and Models for Every Projection Requirement!

For sharp, brilliant projection of motion pictures, slidefilms, slides and other visual teaching material, leading schools and universities as well as our Armed Forces use Da-Lite Screens. They are available in many sizes and styles including those with metal mountings such as the Challenger, which can again be supplied for uses approved by the War Production Board. Ask your local office of the War Production Board for the latest regulations governing the sale of screens under W.P.B. order L-267.



### DA-LITE ELECTROL

For large classrooms and auditoriums, combines long life with utmost convenience. It is raised and lowered by means of an electrical control switch placed at the most convenient location.

There is no strain on the fabric and no danger from accidental flip-ups, as the screen is rolled or rerolled electrically at constant speed.



### DA-LITE MODEL B

Because of its low price and high quality this spring-operated roller-type screen is the most popular wall type screen for classroom and auditorium use. Metal case protects screen from dust when not in use. 13 sizes from 22" x 30" to 84" x 84" inclusive.

*Where  
Portability  
Is  
Important  
Choose the*



(Reg. U.S. Pat. Off.)

### CHALLENGER SCREEN

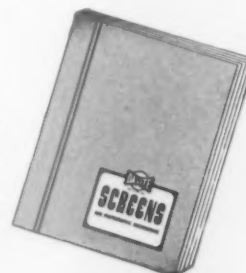


This model is ideal where one screen must serve several classrooms. Easily carried. Quickly set up. It can be adjusted in height by merely releasing a spring latch and raising the extension support.

Its exclusive slotted square tubing (with smooth-operating inner-locking device) makes it the only screen that can be adjusted in height without separate adjustments of the case. It is a physical impossibility to rip the screen fabric from the roller in raising the Challenger to desired height. Positive and foolproof! 12 sizes from 30" x 40" to 70" x 94" inclusive.

### WRITE FOR CATALOG!

Send for 40-page data book on screens, describing all Da-Lite models and containing valuable information on screen selection.



# RADIANT MFG. CORPORATION

1160 W. Superior Street, Chicago 22, Illinois

## A Complete Line of Projection Screens especially designed for Educational Requirements



MODEL DS

Easy to Operate  
Fully Adjustable  
Light in Weight  
Sturdily Constructed

The complete line of Radiant Screens has been especially built to meet every projection need in the field of visual education. These screens incorporate exclusive features and advantages that have won wide favor in thousands of schools, universities, libraries, museums and government departments from coast to coast.

### Radiant Metal Tripod Portable Screens

Engineered to achieve strength and rigidity with a minimum of weight. Hy-Flect glass-beaded screen surface assures brilliantly clear pictures. Adjustable to highest or lowest position easily and quickly; and to ANY position in-between.

#### MODEL DS DeLUXE PORTABLE TYPE

30" x 40" .....	\$13.75	48" x 48" .....	\$21.50	45" x 60" .....	\$27.50
40" x 40" .....	17.75	39" x 52" .....	21.50	60" x 60" .....	32.00
36" x 48" .....	18.75	52" x 52" .....	21.95	52" x 72" .....	33.00

### Radiant Wall Screens

Ideal for easy wall mounting for any type of class, projection or recreation room. When rolled up, screen is protected in sturdy, dust-proof metal housing, equipped with two metal loops for hanging and spring adjustment device to roll screen up and down smoothly and quickly.



MODEL W

#### MODEL W

30" x 40" .....	\$ 6.95	39" x 52" .....	\$11.95	60" x 60" .....	\$21.00
40" x 40" .....	8.50	52" x 52" .....	13.50	52" x 72" .....	20.50
36" x 48" .....	9.95	45" x 60" .....	15.95	72" x 72" .....	31.00
48" x 48" .....	11.50			63" x 84" .....	32.00

### Radiant Wall and Ceiling Screen



MODEL EC

RADIANT'S Streamlined Wall and Ceiling Screen has been used with outstanding success in a large number of universities, schools and colleges, churches, auditoriums, camps and training centers. The new light weight, metal housing (optional) protects the sturdy pliant and crystal clear "HY-FLECT" (high reflection) screen surface which shows details more sharply, more contrastingly, brighter and clearer.

Sizes	MODEL E Without Cover	MODEL EC With Cover
6' x 8'	\$ 44.50	\$ 50.50
8' x 8'	53.50	62.50
7' x 9'	55.50	67.50
9' x 9'	62.50	74.50
8' x 10'	66.00	79.50
10' x 10'	71.50	84.50
9' x 12'	99.50	117.50
12' x 12'	112.50	130.50

### New Radiant Screen Finder



Shows at a glance: 1. The proper screen size for each distance between screen and projector with a given lens; 2. The proper screen model to select; 3. The proper distance between screen and projector to obtain any desired size of picture; 4. The proper lens to use to obtain perfect results for each distance. Ideal for users of motion pictures, slide films, lantern or opaque projectors. Fits into the vest pocket. Send only 50c to cover actual cost, including handling and mailing.

### SEND FOR SCREEN CATALOG

Write for latest Radiant Screen Catalog giving full specifications and prices for the complete line of Radiant Screens for every purpose—tripod, ceiling, wall, wall and ceiling, and table models from 20 inches x 40 inches to 20 feet x 20 feet.

THE AMERICAN SCHOOL AND UNIVERSITY—1944



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Quarries and Mills at Schuyler, Va.

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Natural quarried stone of medium hardness, blue-gray in color, produced and fabricated for more than 50 years; used in increasing quantities for:

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## ALBERENE TREAD STOCK

Selected stone of extreme hardness, reserved exclusively for Stair Treads, Landings, Platforms, and Flooring. Tests show an abrasive hardness factor of 25-40, the highest durability factor on the National Bureau of Standards scale of any natural stone commercially used for these purposes. Its siliceous nature makes it non-slip wet or dry.

## GRADE 25 ALBERENE

Variety of extremely hard stone, especially selected for laboratory working surfaces. Takes a permanent high sheen when rubbed down with oil. Abrasive hardness factor, 25-40, National Bureau of Standards tests.

## ALBERENE BLACK SERPENTINE

This natural stone is becoming extremely popular. Its great resistance to weather action makes it desirable for exterior as well as interior work. When sand-blasted (as in spandrels) the fine tracery of the designs stands out against the polished black surface. Abrasive hardness factor, 30-45, National Bureau of Standards tests.

## ALBERENE TREMOLITE

An interesting addition to the line. In honed finish, shows clear white markings. Two varieties, one polishes to a dark

green, the other to a dark blue-gray. Abrasive hardness factor, 25-40, National Bureau of Standards tests.

## PHYSICAL AND CHEMICAL PROPERTIES

All grades of Alberene Stone are homogeneous and finely granular in all directions, dense and non-stratified, chemically resistant, impervious and non-staining. Alberene soapstone is easily machined—bored, slotted, grooved, tongued, turned—without splitting or spalling.

## LABORATORY FIXTURE CONSTRUCTION

Alberene laboratory fixtures are practically one piece structures of solid stone. Table top slabs are united by a practically invisible joint employing a strip of non-corrosive metal cemented in grooves, with abutting slab edges sealed with acid-proof cement. Fume hoods, sinks and tanks are assembled with tongue-and-groove joints held by hidden bolts and nuts and cemented—permanently gas and liquid tight.

## SERVICE IN DESIGN AND INSTALLATION

Every laboratory of major importance equipped in the past 50 years has used Alberene soapstone wholly or in large part. If you have a war training course you will undoubtedly need additional equipment. Let us help. We have the experience and the facilities.

## MANUFACTURING FACILITIES

Quarries and mills at Schuyler, Virginia, are the largest in the world devoted exclusively to the production and fabrication of special purpose stone.



Section of Chemical Engineering Laboratory, Rensselaer Polytechnic Institute, Troy, N. Y.



Alberene Stone Stair Treads and Platforms in Woodrow Wilson High School, Washington, D. C. Nathan C. Wyeth, Municipal Architect

THE AMERICAN SCHOOL AND UNIVERSITY—1944

# GENERAL CERAMICS COMPANY

Manufacturers of Acid-Proof Chemical Stoneware Laboratory Equipment

Keasbey, New Jersey

New York Buffalo Los Angeles Portland San Francisco Seattle Tacoma Spokane Toronto Montreal

The Chemical Stoneware Division of General Ceramics Company makes a complete line of acid-proof chemical stoneware equipment for chemistry and physics laboratories in educational and research institutions, for general industrial chemical purposes, and for hospitals, electro-plating plants, newspapers, photo-engraving shops, and other establishments where corrosive fluids are used.

General Ceramics Chemical Stoneware Laboratory Equipment is widely used in educational institutions throughout



## Description

General Ceramics Chemical Stoneware is a dense granite-like material with an attractive glazed surface. Both the glaze and the body of the ware are completely impervious to all acids and other chemicals, excepting hydrofluoric acid. The surface glaze is an integral part of the ware itself

and therefore free from crazing and cracking. General Ceramics ware is mechanically strong, leakproof, and easy to keep clean, and it cannot contaminate the chemicals handled. It lasts indefinitely and there is no upkeep or replacement expense.



TY Fitting



Quarter Bend



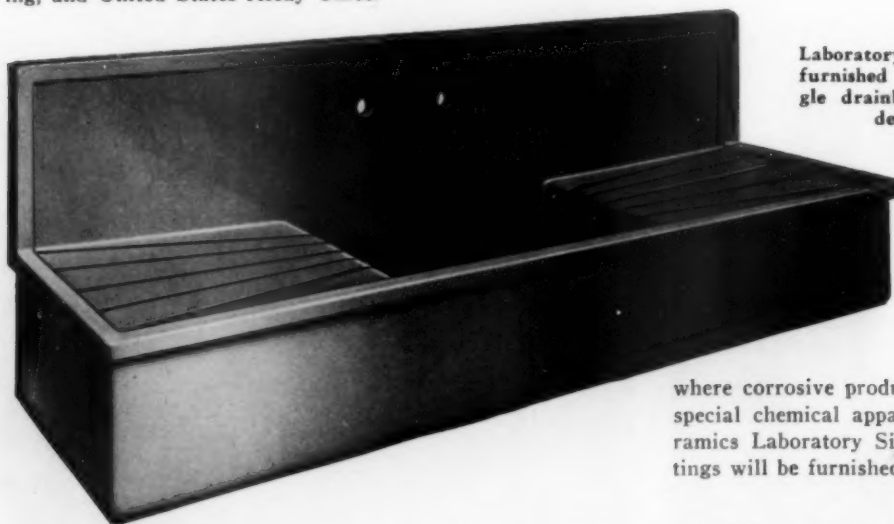
Socket Pipe

the country. In fact, a list of the colleges and universities with chemistry laboratories equipped with General Ceramics Chemical Stoneware is practically a roster of our leading institutions of learning, including among many others Yale, Harvard, Vassar, Radcliffe, Duke, Pittsburgh, Wesleyan, Lehigh, Tulsa, Toledo, Berea, Purdue, Vanderbilt, McGill, California Institute of Technology, and the Universities of Maryland, Illinois, New Hampshire, Connecticut, Indiana, Penn-

sylvania, Ohio, Wisconsin, Nevada, California, and California at Los Angeles. General Ceramics equipment is used also in such buildings as the Walter Reed Hospital in Washington, the Curtis Publishing Company Building in Philadelphia, and in New York, the Times Building, Metropolitan Lite Building, and United States Assay Office.



Laboratory Sink with integral back and side. Can be furnished without back and side in various types and sizes as required



Laboratory Sink with double drainboard. Can be furnished also without the integral back, with single drainboard (either right or left), and with details of construction as required

## Engineering Service and Catalogues

Our Engineering Department will gladly assist in selecting the right stoneware equipment for any requirements. We cooperate in laying out laboratories and other buildings where corrosive products are handled, also in the design of special chemical apparatus. New bulletins on General Ceramics Laboratory Sinks and on Acid-Proof Pipe and Fittings will be furnished on request.

## Specifications

Specifications should read as follows: "All parts of this installation subject to the action of acids or acid wastes are to be made of high-grade acid-proof chemical stoneware manufactured by the General Ceramics Company of Keasbey, N. J."

The General Ceramics line of stoneware equipment includes laboratory sinks, drain lines and fittings, sumps, fume ducts, pumps, ventilating fans, and countless other items.

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# MAURICE A. KNIGHT

## Acid, Alkali and Corrosion Proof Chemical Stoneware

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### PRODUCTS

Acid Waste Pipe and Fittings  
Acid-Proof Fume Ducts  
One-Piece Laboratory Sinks  
Acid-Proof Table Troughs  
Neutralizing Sumps  
Tanks, Jars, Filters, etc.



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University of Arkansas  
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### KNIGHT-WARE

Knight-Ware is an improved ceramic material that is dense, tough and wholly inert to the action of chemical solutions or gases, weak or strong, hot or cold (Hydrofluoric acid and hot caustic solutions excepted). Its acid-proof quality does not depend upon any glaze or surface treatment. "It is the body itself" that is entirely acid-proof. Knight-Ware equipment, properly installed, is trouble-free and permanent.

### LABORATORY SINKS

Knight-Ware sinks are custom-made to specified measurements without extra cost. The one-piece construction, smooth surfaces, rounded corners and acid-proof quality mean a freedom from leaks and a cleanliness that is permanent. Splash backs, drainboards, aprons and outlets of several styles may be had as integral parts of the sink. Bottoms are sloped to insure complete drainage. The finish is a rich brown salt glaze that will not stain or peel.

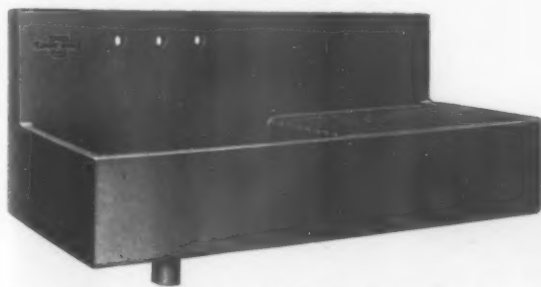


Fig. 237 RD Sink with right hand drainboard. Available with left hand or double drainboards and apron.

### ACID WASTE PIPE AND FITTINGS

Knight-Ware pipe and fittings are made in standard designs in any bore from 1 to 60 inches and straight lengths up to 5 feet. Special pieces to fit unusual places or to eliminate extra joints are available at low cost. Knight-Ware pipe is light in weight, strong and acid-proof.

Joints, packed and poured to our specifications, are tight and lasting.

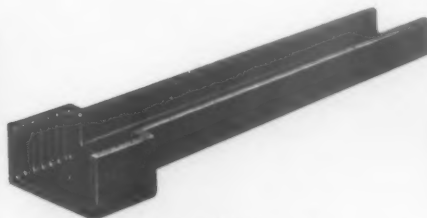
### KNIGHT-WARE FUME DUCTS

Ventilating pipe is available in round or rectangular shapes in bores up to 60 inches and with bell and spigot, flanged or plain butt end connections. Specify Knight-Ware for lasting protection.

### SERVICE

If you are planning a new laboratory or modernizing your present one, we offer our knowledge and practical experience gained from scores of Knight-Ware installations.

Our fully illustrated Laboratory Equipment catalog will be sent upon request.



275A Table Trough



268 Knight-Ware S-Trap with Cleanout



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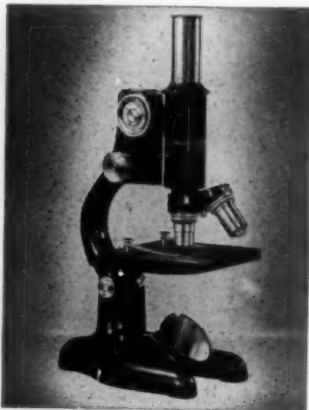
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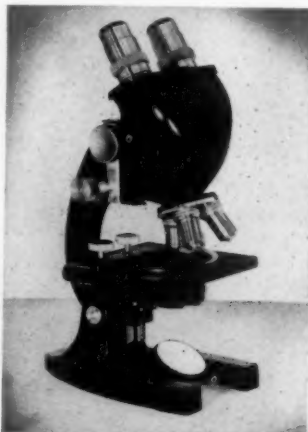
## FB MICROSCOPE

Microscope FB is especially designed and built for elementary science work and its price, based on quantity production, is in line with the most restricted budget. It is ruggedly built to stand many years of hard class room usage. Its optics are of the same precision type that characterize the more expensive research type of instrument. Features include standard size, coarse and fine adjustments, double revolving nose piece, standard objectives and eyepieces, disc diaphragm, solid Bakelite stage concave mirror, etc. Velvety black, wear-resisting finish. Magnifications range from 20 to 310 diameters.

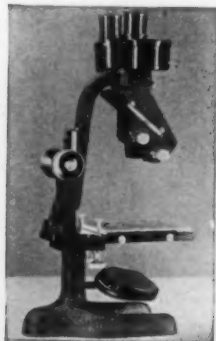


## CTA MICROSCOPE

This microscope is especially adapted for advanced Biological work, for Medical Study and Diagnosis and as a general purpose microscope in universities. Has inclined binocular body (interchangeable with monocular tube for photomicrography) with parallel eyepiece tubes. Built-on mechanical stage holds slides 50 x 75 mm., permitting examination of the entire area. Abbe Condenser 1.25 N.A. in full ring mount is in rack and pinion sub-stage. Revolving, dustproof nosepiece, centered and parfocalized at the factory. Optical equipment of uniform high excellence includes achromatic and fluorite objectives.



## K TYPE BINOCULAR MICROSCOPE



The great popularity of the K Type Binocular Microscope has prompted us to offer the Model "BK" for schools and universities. Its range of magnifications of from 4.2X to 150X especially suits it for biological, bacteriological and paleontological work. An interesting feature of this series is the new dustproof Shuttle nosepiece, specially made for this series. This microscope gives stereoscopic, three dimensional effect. Image is upright and unreversed. Exceptionally wide field.

## B&L REFLECTOR LAMP

This lamp fills a definite need in work with both the monocular or binocular non-objective microscope and the stereoscopic wide field microscopes. Elliptical mirror with adjustment provides diverging, parallel or converging light.

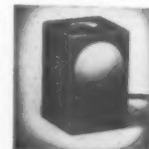
Jointed arm mounting permits all-angle illumination above or below stage. With adjustable transformer, light intensity is exactly adjustable to the work in hand.



## OTHER MICROSCOPE LAMPS



Other B&L Microscope Lamps are available for various purposes in the school laboratory. The two shown herewith are (right) a sub-stage lamp and (left) the Universal Microscope Lamp.



## B&L MICROTOMES

The B&L line of Microtomes is most complete. The Minot Automatic Rotary Microtome (illustrated) is ideal for rapid serial sectioning, cutting section with accuracy down to 1 micron in thickness. Feeding mechanism operates automatically. Dustproof operating mechanism. Catalog D-16 describes the complete line.



## B&L SPECTROGRAPHS

The complete B&L line of Spectrographic Equipment covers every need. Models range from the Bunsen Spectroscope (illustrated) for elementary class room work to the Large Littrow Spectrograph for examining complex alloys. Each is designed and built with the utmost care and due to our great experience in this field represents all of the best features necessary for both teaching and laboratory research. Catalogs D-221 and D-20 give complete details.



## QR MAGNIFIER



This is an adjustable tripod type magnifier which is placed directly over the specimen. Has double lens, magnifying 7.5X. Useful for the school laboratory. Other magnifiers for various purposes are available.

## SEND FOR CATALOGS

For complete information on Laboratory Microscopes send for Catalog D-185. For information on B&L Balopticons see page 316 this catalog. Remember the instruments listed on these pages are but a small part of the B&L Line. If you have need for information on any optical products whatsoever, Bausch & Lomb will gladly be of service to you.

# SPENCER LENS COMPANY

Buffalo, New York

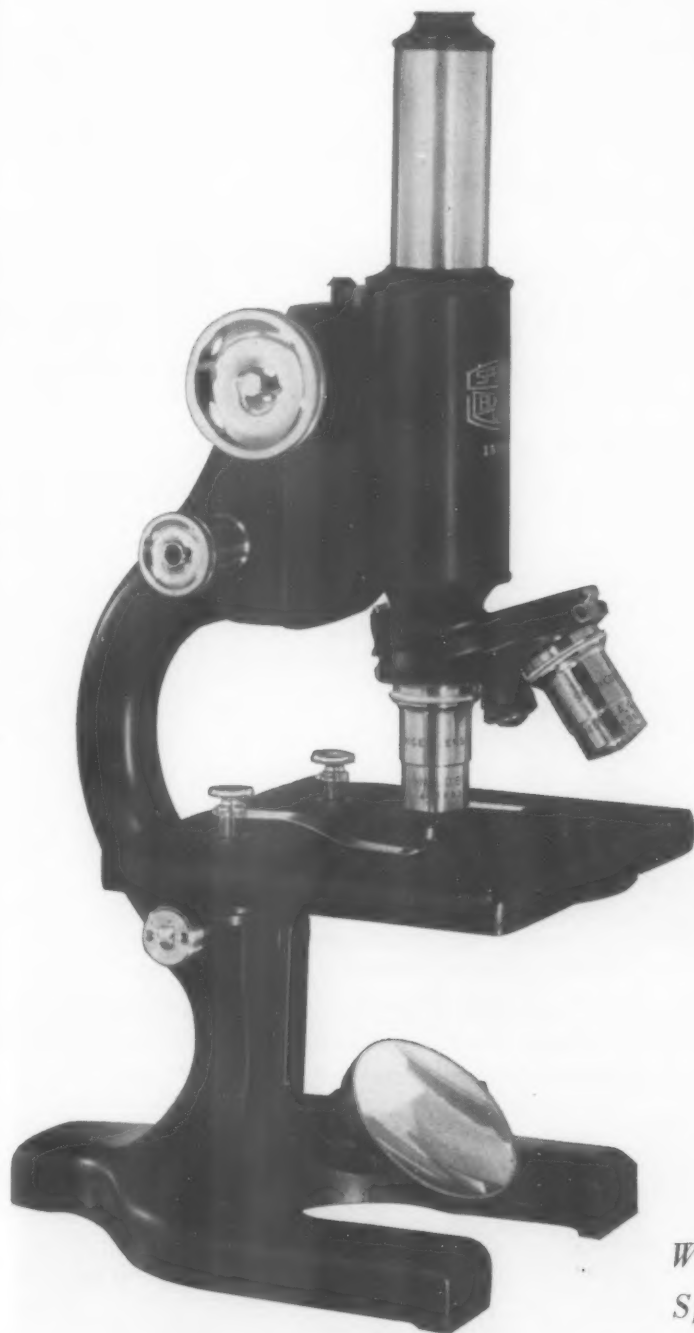


Manufacturers of

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Delineascopes—Photomicrographic Cameras

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## Spencer No. 66 Elementary Microscope

Since the start of this century many thousands of students have enjoyed first-hand experience with a microscope—have studied science by working with the tools of the scientists. Such observations will always be treasured memories.

As this book goes to press all of the greatly expanded Spencer facilities are concentrated on supplying optical instruments for the Armed Forces, war industries and Public Health.

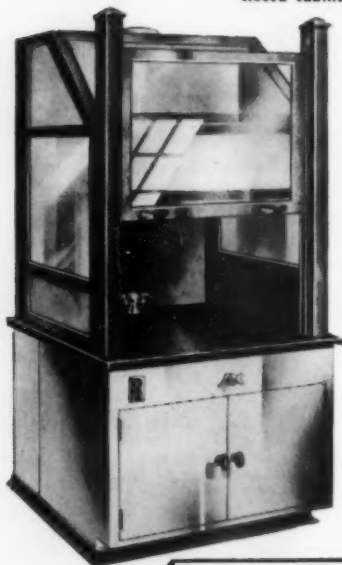
*When the world is again at peace, a greater Spencer organization will be ready to serve you.*



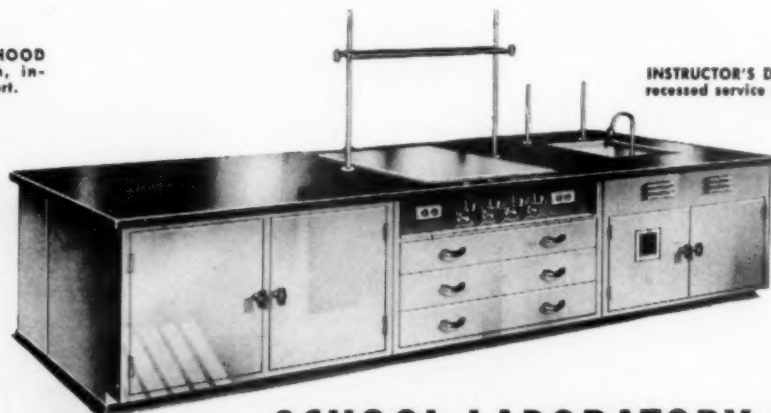
## LABORATORY FURNITURE COMPANY, INC.

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CHEMICAL FUME HOOD  
SH38C single sash, in-  
closed cabinet support.



INSTRUCTOR'S DESK No. 8250  
recessed service fixtures.



# NEW

## SCHOOL LABORATORY EQUIP- MENT BUILT TO INDUSTRIAL LABORATORY SPECIFICATIONS

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TABLES — Science, Physics, Chemistry, Biology, Home Economics, Manual Arts, Geology, Lecture, Demonstration, Instructors, Balance, Dark Room Developing, Bacteriology, Microscope, Medical, Research, Private Laboratory. CASES AND CABINETS — Chemical, Apparatus, Instrument, Glassware, Microscope, Museum, Specimen, Acid Storage, Map and Chart. CHEMICAL FUME HOODS (OPEN AND CLOSED TYPES) — Air Conditioned, complete with exhaust fans and ducts. Also ACID-PROOF SINKS AND TANKS and SPECIAL LABORATORY FITTINGS AND ACCESSORIES.

Feature by feature, every characteristic of STEELAB school laboratory equipment is 100% professional! It is made to precisely the same specifications as STEELAB industrial laboratory equipment, which has served through more than 20 years of peace and war, in America's outstanding laboratories.

STEELAB has over 10,000 installations on record without extensive repairs — with minimum maintenance.

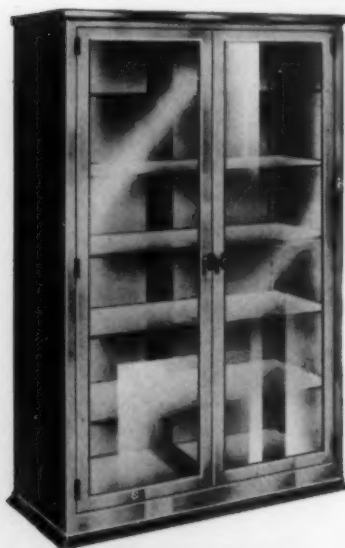
Fireproof, permanent, almost indestructible STEELAB has been time-tested under extreme conditions, proving itself the most dependable value for your appropriation.

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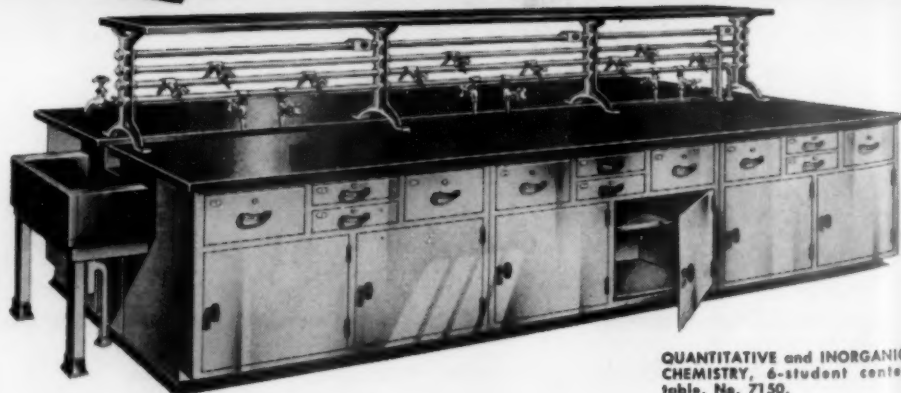
Why not avail yourself of our Engineering Service which we will gladly furnish without obligation? This includes discussion of your problems, preparation of plans and specifications, and budget estimates.

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# BARNSTEAD STILL AND STERILIZER CO., INC.

15 Lanesville Terrace, Forest Hills, Boston, Mass.  
Original "BARNSTEAD" Water Distilling Equipment

Standard Water Stills for Laboratories  
Extra Duty Stills for Hard Water Service



Storage Tanks for Distilled Water  
Complete Line of Mountings and Accessories



1 gallon per hour electrically-heated still



1 gallon per hour steam-heated still

For more than 60 years, Barnstead Stills have been the outstanding laboratory water stills. Over 30,000 are now in use. Such Barnstead features as counter-current condensation, hot well and condenser venting, raw water preheating, splash proof baffles, extra large evaporators and pure block tin linings insure the highest grade of distillate. Copper and brass construction and the finest heating elements obtainable provide maximum efficiency and lowest operating and maintenance costs.

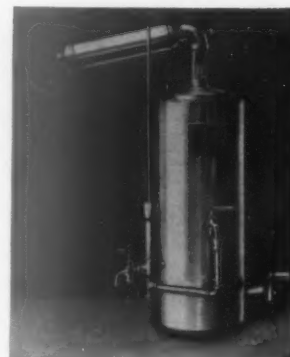
Attractively finished, Barnstead Water Stills conform with other laboratory equipment. Their sizes range from  $\frac{1}{2}$  gallon per hour up. Operation is by gas, steam, electricity or kerosene.

## Extra Duty Stills for Hard Water Service

With the same capacities and operating elements as the Standard Models, Barnstead manufactures Extra Duty Type Stills for distilling water that is either badly contaminated or analyzes more than 50 parts per million total hardness. These stills have evaporators with extra large disengaging space to take care of excessive foaming and a constant bleeder device to prevent rapid scale formation in the evaporator.

## Mountings and Accessories

Barnstead Stills can be mounted on stands, wall brackets, tables, shelves or concealed behind a wall. They are sold with or without storage tanks—metal or wood, tin lined—in many sizes. A full line of automatic cutoffs as well as self-starting, self-stopping and self-flushing controls are available. Write for new Catalog D.



1 gallon per hour gas-heated Extra Duty Still



Barnstead Still with storage tank and stand

## STILLS FOR LABORATORIES—STANDARD AND EXTRA DUTY TYPES

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Capacities 1, 2, 5, 10, 15, 20 and 30 gallons of distilled water per hour. All sizes are also furnished in the Extra Duty or hard water type. Evaporators are fitted with steam-heated coil. Steam at 40-60 pounds pressure should be used to heat Still. Stills to operate on lower pressures furnished to order. Require 9 pounds of steam and 8 gallons of cooling water per gallon of water distilled. Very economical in operation. Larger sizes up to 500 gallons per hour. When ordering, specify capacity required in gallons per hour, your steam pressure and type desired (standard or Extra Duty).

### GAS-HEATED

Capacities  $\frac{1}{2}$ , 1,  $1\frac{1}{2}$ , 2,  $2\frac{1}{2}$ , 5 and 10 gallons of distilled water per hour. Also Extra Duty models (for hard water) in all sizes. Stills are furnished complete with built-in gas burner and mixer. Flame is encased for high efficiency. Burners are adjustable for gases of 450 to 1100 B.T.U. value per cubic foot. Burners for other gases furnished to order at no extra charge. Require 9600 B.T.U. of gas heat and 8 gallons of cooling water per gallon of distilled water. When ordering, state capacity required in gallons per hour, kind of gas, and type desired (standard or Extra Duty).

### ELECTRICALLY-HEATED

Capacities  $\frac{1}{2}$ , 1,  $1\frac{1}{2}$ , 2, 3, 5 and 10 gallons of distilled water per hour. A set of totally immersed electric heating elements permit very efficient heating. Elements are replaceable. The Stills are regularly furnished to operate on 110 or 220 volts alternating or direct current as specified. Require 2600 watts of electricity and 8 gallons of cooling water per gallons of water distilled. Very widely used in laboratories. When ordering, specify capacity required in gallons per hour, your voltage, and type desired (standard or Extra Duty).

# THE EATON-DIKEMAN COMPANY

Manufacturers of Filter Papers

Mount Holly Springs, Penna.

LABORATORY FILTER PAPER FOR SCHOOLS,  
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FOR USE IN HEAVY AND LIGHT FUNNEL WORK,  
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The Eaton-Dikeman Company, established in 1893, is today the world's largest manufacturer of quantitative, qualitative, and industrial filter papers; carrying in stock more than ninety grades of a quality that is dominated by the uniformity and purity that is found only in papers processed under a strict laboratory control and in a locality famous for the purity of its water and freedom from industrial and aerial pollutions.

The Eaton-Dikeman trademark assures you of a filter paper that is made from pure spring water free from chemicals and salts, that, if present, would prove harmful to many operations.

Eaton-Dikeman laboratory filter papers are sold by all laboratory supply dealers under their own special labels, as well as E & D labels. To be sure of obtaining E & D Quality, it is best to ask for the E & D label.

The qualitative grades are sixteen in number and are best described in our Descriptive Booklet No. 1, which we shall be glad to send you on request.

## NEW FILT ANALYTICAL PAPERS

Our NEW FILT analytical grades, which we developed sometime ago, have been used by chemists the world over, giving excellent results. They were created to replace the foreign single-acid washed papers to be used for any analytical procedure where a strictly double-acid washed paper is not necessary. They are made of the very highest quality of pure

cotton fibre and are specially treated and processed to insure a high degree of purity and a low ash weight. The NEW FILT grades, Nos. 1, 3, and 4, have an ash weight the equivalent of any single-acid washed imported paper.

NEW FILT papers have been approved by many testing laboratories and are being used in industrial laboratories throughout our country, Canada and Mexico.

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The grades described below are stocked in all standard sizes 12.5 cm. to 60 cm.

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OUR DESCRIPTIVE BOOKLETS NOS. 1, 2 WILL GIVE YOU A COMPLETE FILE ON LABORATORY FILTRATIONS. SENT GRATIS ON REQUEST

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Use the PURITY SERIES for your more precise qualitative filtrations. They are the highest quality of unwashed filter papers.

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## MEASURING INSTRUMENTS FOR RESEARCH, TEACHING AND TESTING

Adapted, with a high degree of exactness, to the latest needs of the research scientist, of the student and of the man who makes routine tests in laboratory, plant or field, is the wide variety of apparatus briefly listed in the following pages. Usually, there will be found a choice of instruments and their accessories: for high or moderate precision; for table use or portable; for general use or specialized. In some, all components are self-contained. Others are separate units which can be combined to form various assemblies. In all, we endeavor to embody sound measuring principles in constructions of genuine merit, to keep designs in advance of demands for operating convenience, to use suitable materials assembled by skilled craftsmen.\*

Almost invariably, adjustments of L&N instruments prove better than our guarantees. Realizing that nothing is permanent and that the best of standards are not absolute, we make our claims conservatively. Our objective is so to proportion accuracy, sensitivity and readability in every instrument which bears the L&N insignia, and to build it so well, that its owner can have complete confidence in every measurement made within error limits which are definitely specified. This is an objective which our

executives and workers have joined in holding conspicuously before them for over forty years . . . during which the extensive and ever-widening contacts we have had with both science and industry have helped us to advance progressively in the art of instrument making. In recent years, the application of scientific principles to an extensive line of instruments adapted to the more rugged conditions of industry, has enabled us to equip, staff and qualify more thoroughly than ever to carry forward the fundamental instrument arts in step with the growing demands of science.

### INDUSTRIAL-TYPE EQUIPMENTS SOLVE MANY LABORATORY PROBLEMS

Industrial-type instruments and furnaces (not listed here) have many uses in the laboratory. Micromax recorders calibrated to read directly in temperature, pH or other units furnish continuous chart records of test runs. Sometimes, recorders which control automatically, or even non-recording controllers, are used. Industrial-type indicators, portable models especially, are often used for a variety of measurements; optical pyrometers, for high temperatures. In metallurgical laboratories, the smaller sizes of Hump and Homo electric heat-treating furnaces are used for hardening, carburizing, nitriding, tempering and annealing.

### RESISTORS

### INDUCTORS

### CAPACITORS

### STANDARD CELLS

For use as reference or working standards in d-c and a-c bridge measurements, we offer a wide choice of fixed and adjustable standards—resistors, inductors, capacitors—and standard (potential) cells. Usually, you will find listed the ones needed to cover any desired range.

Each L&N standard is a convenient unit which can be depended upon to retain its stated precision. Because the properties of resistance materials, dielectrics, etc. are not invariable, and even the best standards are not absolute, a margin is allowed between accuracy of adjustment and that guaranteed. To assure reliability, only that accuracy is claimed which a given standard can be expected to maintain, in normal use, for a long period.

**RESISTORS:** You'll find both fixed resistors and adjustable resistance boxes—some primarily for direct current, others specially designed for alternating current. Many are available in a choice of resistance values.

**INDUCTORS:** For use as standards of inductance in a-c bridge measurements up to 1000 cycles, we list on pages 334 to 335 a choice of fixed and adjustable inductors.

The fixed inductors listed are toroidal coils, mounted on bakelite plates, enclosed in ventilated cases. Up to 1000 cycles, these

inductors are practically immune from stray-field errors, cause no objectionable external fields, and show no appreciable increase in resistance.

For varying self inductance of a circuit, or mutual inductance between two circuits, we list Brooks Inductometers. Standard instruments have self-inductance scales only.

**CAPACITORS:** Both mica and air capacitors are available in a choice of fixed and adjustable models. Due to improved mechanical switching arrangements, both air and mica capacitors suitable for use at carrier frequencies are available, and two of the air capacitors listed (1187 and 1188) can be used at frequencies of a few megacycles.

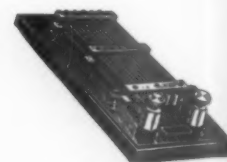
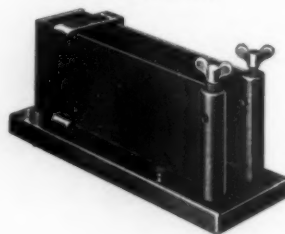
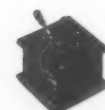
**STANDARD (POTENTIAL) CELLS:** Here listed are the standard cells we recommend for use with Potentiometers (page 336) which require an external cell.

For measurements at either high or moderate precision, we recommend the 7308 Eppley Standard Cell for use with the several null potentiometers listed; the 7309 Low Resistance Cell, for use with Brooks Deflection Potentiometers. Each is supplied with a certificate issued by the Eppley Laboratories. The 7310 Cell should be used only for work where relatively low precision is acceptable.

\* Prices listed may of course be changed without notice. Formal quotations, made on request, are always good for 30 days.

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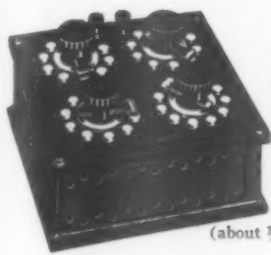
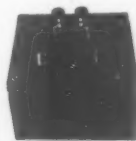
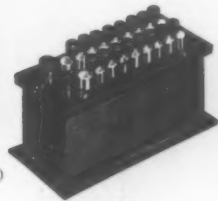
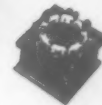
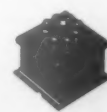
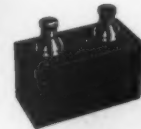


4210  
(about 1/8 actual size)4020, 25, 30, 35, 40  
(about 1/2 actual size)4221, 4222 is similar  
(about 1/8 actual size)4223  
(about 1/8 actual size)4360, 4361  
(about 1/6 actual size)4369, 4372, 4375  
(about 1/12 actual size)4363  
(about 1/12 actual size)4205-09  
(about 1/2 actual size)4245  
(about 1/24 actual size)

## FIXED D-C RESISTORS

Instrument	List Number	Resistance, Ohms	Current Rating, Amperes	Limit of Error	Price	Refer to Catalog
One-Ohm Standard Resistor (A primary standard of resistance which establishes a new order of stability.)	4210	1 Nominal	0.1	N.B.S. Certificate required giving value $\pm 0.0001\%$ in terms of ohm maintained by National Bureau of Standards.	\$100.00	E-53 E
National Bureau of Standards Type Resistors (For use as primary standards of resistance.)	4020	1	0.3	$\pm 0.01\%$	20.00	E-53 E
			1	$\pm 0.04\%$		
	4025	10	0.1	$\pm 0.01\%$	20.00	
			0.3	$\pm 0.04\%$		
	4030	100	0.03	$\pm 0.01\%$	20.00	
			0.1	$\pm 0.04\%$		
	4035	1000	0.01	$\pm 0.01\%$	20.00	
			0.03	$\pm 0.04\%$		
Reichsanstalt Type Resistors (For use in accurate measurement of current with a potentiometer, and as standards of comparison in low-resistance measurements.)	4040	10,000	0.003	$\pm 0.01\%$	25.00	E-53 E
			0.01	$\pm 0.04\%$		
	4221	0.1	3*	$\pm 0.02\%$	50.00	
			10*	$\pm 0.05\%$		
Resistors (Shunts) for Large Currents (Primarily for accurate measurement of large currents with potentiometers, and as standards for comparison in low-resistance measurements.)	4222	0.01	10*	$\pm 0.02\%$	55.00	E-53 E
			30*	$\pm 0.05\%$		
	4223	0.001	30*	$\pm 0.02\%$	120.00	
			100*	$\pm 0.05\%$		
	4360	0.1	15	$\pm 0.04\%$ when cooled by air at ordinary room temperature.	55.00	
	4361	0.01	100		100.00	
	4363	0.001	300		90.00	
Secondary Resistance Standards (Working standard of moderate accuracy.)	4364	0.001	500		175.00	E-53 E
	4369	0.00004	1500		187.00	
	4372	0.00002	2000		187.00	
	4375	0.00001	3000		300.00	
	4205	1	1.0	$\pm 0.1\%$	10.00	E
Tenth-Megohm Resistance Box (A high-resistance standard with short-circuiting switch.)	4206	10	0.3		10.00	
	4207	100	0.01		10.00	
	4208	1000	0.003		10.00	
	4209	10,000	0.001		10.00	
	4245	100,000	0.007	$\pm 0.1\%$	50.00	E-53 E

\* Maximum current assumes operation in stirred oil bath.

4716  
(about 1/8 actual size)4775-76  
(about 1/8 actual size)4252  
(about 1/8 actual size)4244  
(about 1/12 actual size)4246  
(about 1/16 actual size)4247  
(about 1/16 actual size)4640  
(about 1/8 actual size)

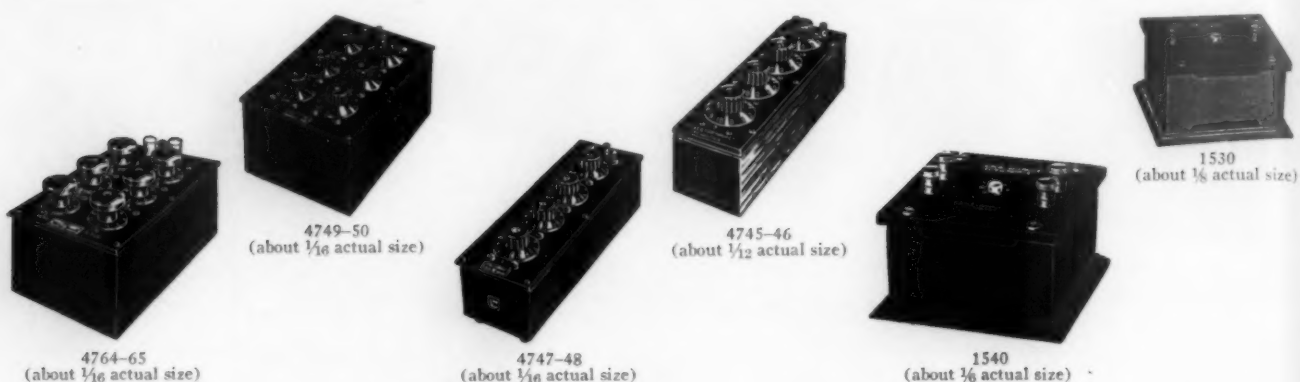
## ADJUSTABLE D-C RESISTORS

Instrument	List Number	Resistance, Ohms	Decade Steps	Current Rating, Amperes	Limit of Error	Price	Refer to Catalog
Open-Dial-Switch Resistance Boxes (For d-c measurements. Combine high precision, speed and convenience.)	4710	100	10x0.1+9(1+10)	When Highest Decade in Use is  0.1 1.0 10.0 100.0 1000.0	Resistance change from zero setting, measured across binding posts, equals dial settings $\pm(0.05\% + 0.005\Omega)$ .	\$ 75.00	E-53 E
	4711	1000	10x1+9(10+100)			70.00	
	4712	10,000	10x10+9(100+1000)			80.00	
	4715	1000	10x0.1+9(1+10+100)			95.00	
	4716	10,000	10x1+9(10+100+1000)			100.00	
	4720	10,000	10x0.1+9(1+10+100+1000)			125.00	
Enclosed-Switch Resistance Boxes (Popular, inexpensive standards of moderate precision. Suitable for d-c and up to 1000 cycles a-c.)	4770	99	9(1+10)	When Highest Decade in Use is  0.1 1.0 10.0 100.0 1000.0	Resistance change from zero setting, measured across binding posts, equals dial settings $\pm(0.1\% + 0.01\Omega)$ .	21.00	E-53 E
	4771	990	9(10+100)			21.00	
	4772	9900	9(100+1000)			21.00	
	4773	999	9(1+10+100)			28.00	
	4774	9990	9(10+100+1000)			29.00	
	4775	9999	9(1+10+100+1000)			35.00	
Post-Office Pattern Resistance Box (Popular for instruction.)	4252	11,110	Resistors: 1, 2, 3, 4, 10, 20, 30, 40, 100, 200, 300, 400, 1000, 2000, 3000, 4000 $\Omega$ .	Equals $\sqrt{1/R}$ where R is highest value resistor in use.	Resistance change from zero setting, measured across binding posts, equals plug readings $\pm(0.1\% + 0.01\Omega)$ .	36.00	E-53 E
Post-Office Pattern Resistance Box (Similar to 4252, but lower total resistance.)	4254	1110	Resistors: 1, 2, 3, 4, 10, 20, 30, 40, 100, 200, 300, 400 $\Omega$ .	Equals $\sqrt{1/R}$ where R is highest value resistor in use.	Resistance change from zero setting, measured across binding posts, equals plug readings $\pm(0.1\% + 0.01\Omega)$ .	30.00	E-53 E
Megohm Resistance Box (A high-resistance standard in 6 sections which can be used independently or in different combinations.)	4244	1,000,000	Subdivided 4 x 200,000 + 2 x 100,000 $\Omega$ .	0.002	$\pm 0.1\%$	200.00	E-53 E
Tenth-Megohm Resistance Box (A high-resistance standard in 4 sections which can be used independently or in different combinations.)	4246	100,000	Subdivided: 10,000 + 20,000 + 30,000 + 40,000 $\Omega$ .	0.005	$\pm 0.1\%$	90.00	E-53 E
Tenth-Megohm Resistance Box (Similar to 4246, but terminals of sections connected to binding posts on insulating pillars on top plate, and links used for connection between posts.)	4247	100,000	Subdivided: 10,000 + 20,000 + 30,000 + 40,000 $\Omega$ .	0.005	$\pm 0.1\%$	65.00	E-53 E

\* Statement assumes that box has been in regular use, or that dials will be rotated or plugs twisted in their blocks before box is put in use after a period of idleness. D-C resistance, with all dials or plugs at zero, does not exceed 0.03 $\Omega$ .

## FIXED A-C RESISTORS

Instrument	List Number	D-C Resistance, Ohms	Reactive Component	Current Rating, Amperes	Limit of Error	Price	Refer to Catalog
Secondary-Standard A-C Resistors (Working standards for a-c measurements.)	4631	1000	1 $\mu$ h for 1000 $\Omega$ standard to 2.5 $\mu$ h for 20,000 $\Omega$ standard. Change of residual, less than 5% for frequencies up to 50 kc.	0.031	In d-c resistance: $\pm 0.1\%$ . Difference between a-c and d-c resistance less than $\pm 0.01\%$ up to 50 kc.	\$13.00	E-53 E
	4632	2000		0.022		13.00	
	4633	3000		0.018		14.00	
	4634	4000		0.016		14.00	
	4640	10,000		0.01		15.00	
	4642	20,000		0.007		17.00	



## ADJUSTABLE A-C RESISTORS

Instrument	List Number	Total Resistance, Ohms	Decade Steps*	Maximum Change of Inductance (or Capacitance) When Setting of Indicated Decade is Changed						Inductance for Zero Setting $\mu\text{h}$	Capacitance for 10,000 Ohm Setting $\mu\text{f}$	Current Rating, Amperes	Limit of Error D-C Resistance Change Across Binding Posts Equals the Reading of the Dials:	Price	Refer to Catalog
				0.01 Ohm Decade $\mu\text{h}$	0.1 Ohm Decade $\mu\text{h}$	1.0 Ohm Decade $\mu\text{h}$	10 Ohm Decade $\mu\text{h}$	100 Ohm Decade $\mu\text{h}$	1000 Ohm Decade $\mu\text{f}$						
A-C Resistance Boxes (Adjustable standards of sturdy permanent construction for precise measurements with a-c bridges. 4765 and 4764 for very low, others for moderately low inductance and capacitance changes.)	4764 Shielded	11,111.1	$10(0.01+0.1+1+10+100+1000)$	0.003	0.006	0.02	0.5	15.0	5.0	1.5	10.0	Equals 0.25 $\sqrt{R}$ where R is highest setting of highest decade in use.	$\pm(0.05\% + 0.005 \text{ ohm})^{**}$	\$300.00	E-53 E
	4765 Shielded	11,111.1	$10(0.01+0.1+1+10+100+1000)$	0.01	0.02	0.05	0.5	15.0	5.0	1.5	10.0		$\pm(0.05\% + 0.005 \text{ ohm})^{**}$	270.00	
	4750 Shielded	11,111.1	$10(0.01+0.1+1+10+100+1000)$	0.02	0.2	0.5	1.0	25.0	7.0	0.7	15.0	When Highest Decade in Use is:	$\pm(0.05\% + 0.005 \text{ ohm})^{**}$	100.00	
	4749 Shielded	11,111.1	$10(0.01+0.1+1+10+100+1000)$	0.02	0.2	0.5	1.0	25.0	7.0	0.7	15.0	1 0.5 10 0.11 100 0.35 1000 0.011			
	4748 Shielded	11,110	$10(1+10+100+1000)$	Lowest dial 1 ohm		0.5	1.0	25.0	7.0	0.4	15.0	Same as 4750	$\pm(0.05\% + 0.005 \text{ ohm})^{**}$	65.00	
	4747 Shielded	11,110	$10(1+10+100+1000)$	Lowest dial 1 ohm		0.5	1.0	25.0	7.0	0.4	15.0	Same as 4749	$\pm(0.1\% + 0.01 \text{ ohm})^{**}$	55.00	
4746 Unshielded	11,110	$10(1+10+100+1000)$	Lowest dial 1 ohm		0.5	1.0	10.0	5.0	0.4	10.0	Same as 4750	$\pm(0.05\% + 0.005 \text{ ohm})^{**}$	60.00		
4745 Unshielded	11,110	$10(1+10+100+1000)$	Lowest dial 1 ohm		0.5	1.0	10.0	5.0	0.4	10.0	Same as 4749	$\pm(0.1\% + 0.01 \text{ ohm})^{**}$	50.00		

\* In 4745-4750 the lowest decade may be removed and a 10,000 ohm decade incorporated for an additional price of \$25.00.

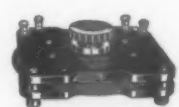
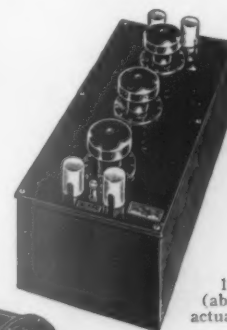
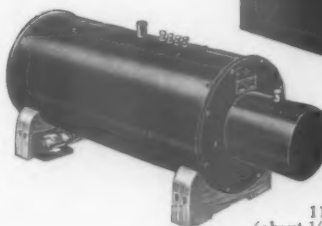
\*\* Statements of d-c resistance change assume that boxes have been in regular use, or

that dials will be rotated before a box is put in use after a period of idleness. D-C resistance, with all dials at zero, does not exceed: 0.03 ohm for 4745 to 4748 inclusive, and for 4764 and 4765; 0.04 ohm for 4749 and 4750.

## FIXED INDUCTORS

Instrument	List Number	Inductance, Millihenrys	Continuous Current Capacity, Amperes	Limits of Error at Frequency of 1000 Cycles:	Time Constant Approximate $\left(\frac{L}{R}\right)$	Price	Refer to Catalog
Standards of Self Inductance (Fixed Inductor)	1530	1	1	$\pm 1\%$	$1 \times 10^{-3}$	\$30.00	E
	1531	10	0.5	$\pm 0.2\%$	$1 \times 10^{-3}$	30.00	
	1532	100	0.15	$\pm 0.2\%$	$1 \times 10^{-3}$	30.00	
	1533	1000	0.05	$\pm 0.2\%$	$1 \times 10^{-3}$	30.00	
Standard of Mutual Inductance (Fixed Inductor)	1540	50	0.15	$\pm 0.5\%$	$5 \times 10^{-4}$	40.00	E



1520  
(about 1/12 actual size)1056  
(about 1/10 actual size)1061  
(about 1/10 actual size)1058  
(about 1/10 actual size)1071  
(about 1/4 actual size)1070  
(about 1/12 actual size)1188  
(about 1/12 actual size)1185  
(about 1/12 actual size)1160-61  
(about 1/10 actual size)

## ADJUSTABLE INDUCTORS

Instrument	List Number	Inductance, Millihenrys	Continuous Current Capacity, Amperes	Limits of Error at Frequency of 1000 Cycles	Time Constant Approximate $\left(\frac{L}{R}\right)$	Price	Refer to Catalog
Brooks Inductometer (Adjustable, self-inductance range)	1520-A	1.5 to 12	1	$\pm 0.3\%$	$2 \times 10^{-3}$	\$150.00	E
	1520-B	12 to 100	0.35	$\pm 0.3\%$	$2 \times 10^{-3}$	150.00	
	1520-C	100 to 800	0.1	$\pm 0.3\%$	$2 \times 10^{-3}$	150.00	
	1520-D	0.8 to 6 henrys	0.03	$\pm 0.9\%$ Calibrated at 60 cycles only	$2 \times 10^{-3}$	150.00	
	1520-X	Special Range				On request	

## CAPACITORS

Instrument	List Number	Capacitance	Decade Steps	Limits of Error	Price	Refer to Catalog
Fixed Mica Capacitor (For high precision)	1056	0.5 $\mu\text{f.}^*$		$\pm 0.25\%$	\$ 30.00	E
Adjustable Mica Capacitor (For high precision)	1051	1 $\mu\text{f.}$ in eight sections.*	0.5, 0.2, 0.1, 0.1, 0.05, 0.02, 0.01, 0.01 $\mu\text{f.}$	$\pm 0.25\%$ in each section.	200.00	E
Adjustable Mica Capacitor (For high precision)	1058	1 $\mu\text{f.}$ in five sections.*	0.5, 0.2, 0.2, 0.05, 0.05 $\mu\text{f.}$	$\pm 0.25\%$ in each section.	65.00	E
Three-Dial Shielded Mica Capacitor (Precision type for measurements at higher frequencies)	1071	1.11 $\mu\text{f.}^*$	10(0.001 + 0.01 + 0.1)	Measured from binding posts, at 1000 cycles, capacitance difference between each setting of each dial and its zero setting (other dials on zero) agrees with nominal value of that setting to $\pm (0.1\% + 0.5 \mu\text{f.})$	325.00	E
Three-Dial Mica Capacitor (For moderate precision)	1070	1 $\mu\text{f.}^*$	9(0.001 + 0.01 + 0.1). Extra 0.001 $\mu\text{f.}$ unit controlled by knife switch.	Same as 1071, except to $\pm (0.25\% + 15 \mu\text{f.})$ .	175.00	E
Adjustable Two-Terminal Air Capacitor (For high-precision measurements of low capacitance. Quartz insulators)	1188	Minimum 50 $\mu\text{f.}$ . Maximum 1300 $\mu\text{f.}$	Calibration based on zero setting of 100 $\mu\text{f.}$ . $12 \times 100 +$ continuously adjustable dial -50 to +100 $\mu\text{f.}$	$\pm 1 \mu\text{f.}$	170.00	E
Adjustable Two-Terminal Air Capacitor (Similar to 1188 except has isolantite insulators)	1187	Minimum 50 $\mu\text{f.}$ . Maximum 1300 $\mu\text{f.}$	Calibrations based on zero setting of 100 $\mu\text{f.}$ . $12 \times 100 +$ continuously adjustable dial -50 to +100 $\mu\text{f.}$	$\pm 1 \mu\text{f.}$	150.00	E
Adjustable Air Capacitor (For ordinary capacitance measurements)	1185	Range 40 to 1100 $\mu\text{f.}$	Scale 0 to 100 uniform divisions.		30.00	E
Adjustable Air Capacitor (For balancing out residual capacitance in bridge assemblies)	1181	Range approximately 8 to 120 $\mu\text{f.}$	Not calibrated.		19.00	E
Adjustable Air Capacitor (Similar to 1181 except for range)	1183	Range approximately 18 to 500 $\mu\text{f.}$	Not calibrated.		21.00	E

\*All mica capacitors may be operated continuously on 350 volts rms, 60 cycles.

## CAPACITORS (Cont'd.)

Instrument	List Number	Maximum Potential Rating	Nominal Value	Limits of Error	Price	Refer to Catalog
Cylindrical-Type Shielded Fixed Air Capacitors	1160	10,000 volts at 60 cycles.	100 $\mu$ f within 2%.	Actual capacitance $\pm 0.2\%$ engraved on nameplate.	\$575.00	E
	1161	25,000 volts at 60 cycles.	100 $\mu$ f within 2%.		775.00	E

## STANDARD CELLS

Instrument	List Number	Internal Resistance	EMF at 20 C	Limits of Error	Price	Refer to Catalog
Unsaturated Standard Cells	7308	Not over 500 ohms.	1.0185 to 1.0195 volts.	$\pm 0.01\%$ of certified value.	\$20.00	E
	7309	Not over 100 ohms.	1.0185 to 1.0195 volts.	$\pm 0.01\%$ of certified value.	25.00	E
	7310	Not over 500 ohms.	1.018 volts.	$\pm 0.1\%$ at 20 C.	12.00	E

## GALVANOMETERS AND DYNAMOMETERS

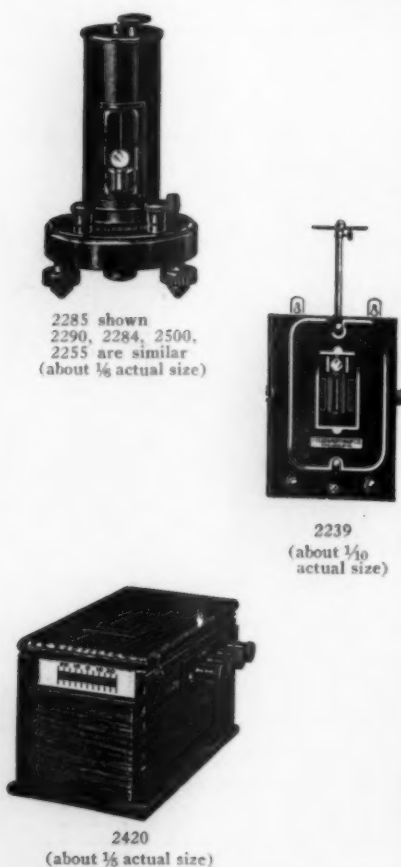
Here, briefly presented, is the L&N line of galvanometers and dynamometers—d-c galvanometers, both moving-coil and moving-magnet types; a-c galvanometers; and astatic dynamometers.

Practically the entire range of applications for galvanometers and dynamometers is covered by the standard instruments we list. Among them, you can almost always find the one you need for use as a balance-point detector in potentiometer or bridge measurements, or for calibrated deflection measurements. Usually, the system is an easily interchangeable unit, so that one galvanometer with extra systems can be made to serve for a wide range of measurements. Galvanometers having characteristics

other than those specified herein, can be supplied. State characteristics you desire—such as period, sensitivity, critical damping resistance—in the order of their importance. In most cases, special characteristics can be obtained with standard parts, and the cost of the instrument will be little more than for listed galvanometers of the same type.

If you wish a more complete discussion of galvanometer characteristics and an explanation of fundamental principles underlying the construction and use of these instruments, we will gladly send you, on request, a copy of our 48-page, pocket-size Note Book ED(1) *Notes on Moving-Coil Galvanometers*.

## D-C MOVING COIL GALVANOMETERS



Instrument	List Number	Sensitivity*** (Per mm at 1 meter or per scale Division)	Period (Sec.)	Resistance (Ohms)		Price	Refer to Catalog
				External Critical Damping	Coil		
Type HS Reflecting Galvanometer (For extra high current sensitivity)	2290	0.00001 $\mu$ a	40	100,000	800	\$150.00	ED
Type HS Reflecting Galvanometer (Extra high voltage sensitivity)	2284-a	0.5 $\mu$ v	1.5	40	21	115.00	ED
	2284-b	0.05 $\mu$ v	7	10	16	115.00	ED
	2284-c	0.1 $\mu$ v	5	20	15	115.00	ED
	2284-d	0.1 $\mu$ v	5	50	25	115.00	ED
	2284-x	(as specified)					
Type HS Reflecting Galvanometer (Very high sensitivity)	2285-a	0.1 $\mu$ v	7.5	25	17	100.00	ED
	2285-b	0.2 $\mu$ v	5	40	16	100.00	ED
	2285-d	0.0003 $\mu$ a	27	40,000	700	115.00	ED
	2285-e	0.003 $\mu$ a	25	500	12	115.00*	ED
	2285-f	0.00004 $\mu$ a	20	70,000	800	100.00*	ED
	2285-g	0.0003 $\mu$ a	7	10,000	500	100.00	ED
	2285-h	0.008 $\mu$ a	1.5	2,500	500	100.00	ED
	2285-x	(as specified)				115.00	
Type R Reflecting Galvanometer (For high sensitivity in general use)	2500-a	0.5 $\mu$ v	5	50	12	60.00	ED
	2500-b	0.0005 $\mu$ a	6	10,000	500	60.00	ED
	2500-c	0.005 $\mu$ a	5	300	40	60.00	ED
	2500-e	0.003 $\mu$ a	3	2,200	500	60.00	ED
	2500-f	0.0001 $\mu$ a	14	22,000	500	60.00	ED
	2500-g	0.0005 $\mu$ a	6	7,000	500	60.00	ED
Type P Galvanometer (For moderate sensitivity in general use. Widely used in educational laboratories. Easy to mount and handle)	2239-a	0.014 $\mu$ a	8	10,000 to 100,000	115	25.00	ED
	2239-b	0.001 $\mu$ a	14	10,000 to 25,000	1,000	25.00	ED
	2239-f	0.0002 $\mu$ a	18	46,000	8,000	45.00	ED
	2239-c	1.5 $\mu$ v	12	165	35	25.00	ED
	2239-d	0.002 $\mu$ a	26	10,000	2,000	35.00	ED
	2239-e	0.011 $\mu$ a	24	230	60	35.00*	ED
Galvanometer with Enclosed Lamp and Scale (For moderately high sensitivity)	2420-a	0.04 $\mu$ a	3	10,000	300	40.00	ED
	2420-d	0.04 $\mu$ a	3	2,000	300	40.00	ED
	2420-b	25. $\mu$ v	3	80	23	40.00	ED
2420-c	0.025 $\mu$ a	3	15,000	1,000	40.00	ED	
Marine Galvanometer (For high sensitivity in use on ship- board)	2255	0.02 $\mu$ a	2	100,000	270	250.00	ED

\* Price includes external resistor for critical damping.

\*\*\* Sensitivities are at least as high as stated; other characteristics within 20%. Microvolt sensitivities are for critical damping resistance in series. Coil resistances include suspensions.

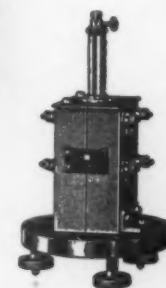
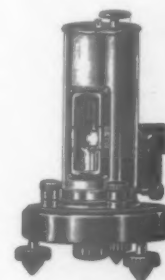
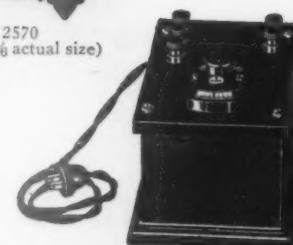
## GALVANOMETERS (Cont'd.)

Instrument	List Number	Sensitivity*** (Per mm at 1 meter or per scale Division)	Period (Sec.)	Resistance (Ohms)		Price	Refer to Catalog
				External Critical Damping	Coil		
Lecture Table Galvanometer (Specialized for demonstration purposes)	2260-a 2260-b 2260-c	0.1 $\mu$ A 0.05 $\mu$ A 0.01 $\mu$ A	2 2 2	50 200 5,000	22 100 1,350	\$ 75.00 75.00 75.00	ED ED ED
Pointer Galvanometer—45 degree scale (Combines sensitivity and convenience)	2310-a 2310-b 2310-c 2310-d	2 $\mu$ A 1 $\mu$ A 0.25 $\mu$ A 0.125 $\mu$ A	2.5 4.5 3 3.5	20 30 110 1,800 10,000	12 16 25 250 1,000	25.00 25.00 25.00 25.00 25.00	ED ED ED ED ED
Pointer Galvanometer—Horizontal Scale (General-purpose galvanometer in its simplest form)	2320-b 2320-c 2320-d	4 $\mu$ A 1 $\mu$ A 0.5 $\mu$ A	3 3 3	50 950 2,400	20 250 1,000	15.00** 15.00** 15.00**	ED ED ED
Portable Galvanometer—Horizontal Scale (Same as 2320, but for field use)	2322-b 2322-c 2322-d	4 $\mu$ A 1 $\mu$ A 0.5 $\mu$ A	3 3 3	50 950 2,400	20 250 1,000	24.00** 24.00** 24.00**	ED ED ED
Pointer Galvanometer—Vertical Scale (Similar to 2320, but has vertical scale)	2330-b 2330-c 2330-d	4 $\mu$ A 1 $\mu$ A 0.5 $\mu$ A	3 3 3	50 950 2,400	20 250 1,000	16.00** 16.00** 16.00**	ED ED ED
Ballistic Galvanometer (Specially designed for ballistic use)	2239-d 2239-e 2285-d 2285-e	0.002 $\mu$ C 0.011 $\mu$ C 0.0003 $\mu$ C 0.003 $\mu$ C	26 24 27 25	10,000 230 40,000 500	2,000 60 700 12	35.00 35.00* 115.00 115.00*	ED ED ED ED

\* Price includes external resistor for critical damping.

\*\* Less 10% for lots of 6 to 11; 20% for lots of 12 or more. A group of galvanometers subject to these discounts may include: 2320's only; 2322's only; 2320's and 2322's; or 2330's only.

\*\*\* Sensitivities are at least as high as stated; other characteristics within 20%. Microvolt sensitivities are for critical damping resistance in series. Coil resistances include suspensions.

2260  
(about 1/4 actual size)2310  
(about 1/4 actual size)2320  
(about 1/4 actual size)2322  
(about 1/4 actual size)2330  
(about 1/4 actual size)2270  
(about 1/4 actual size)2570  
(about 1/4 actual size)2370  
(about 1/4 actual size)

## D-C MOVING MAGNET GALVANOMETER

Instrument	List Number	Sensitivity (Per mm at 1 meter) <sup>a</sup>	Period (Sec.)	Resistance of Fixed Coils (Ohms)	Price	Refer to Catalog
Coblentz Galvanometer (Primarily for use with thermopiles, in measuring minute quantities of radiant energy. More sensitive than moving-coil galvanometers. Has four fixed field coils which can be connected in three different electrical arrangements)	2270	Series 0.0002 $\mu$ A 0.008 $\mu$ V	5	40	\$500.00	ED
		Series-Parallel 0.0004 $\mu$ A 0.004 $\mu$ V	5	10		
		Parallel 0.0008 $\mu$ A 0.002 $\mu$ V	5	2.5		

<sup>a</sup> Sensitivity at least as high as stated; other characteristics within 20%. Voltage sensitivities are at galvanometer terminals, and will be proportionately reduced as total circuit resistance is increased. No damping resistance is stated as, practically, the damping is unaffected by changes in external circuit resistance.

## A-C MOVING COIL GALVANOMETERS

Instrument	List Number	Sensitivity (Per mm at 1 meter or per scale Division) <sup>a</sup>	Period (Sec.)	Coil Resistance (Ohms)	Price	Refer to Catalog
High Sensitivity A-C Reflecting Galvanometer (For high sensitivity in 60-cycle bridge measurements)	2570	0.0035 $\mu$ A	10	18	\$350.00	ED
A-C Pointer Galvanometer (General-purpose a-c galvanometer in its simplest form)	2370-a	5 $\mu$ A	2.6	20	60.00	ED
	2370-c	1 $\mu$ A	2.6	250		
	2370-d	0.5 $\mu$ A	2.6	1,000		

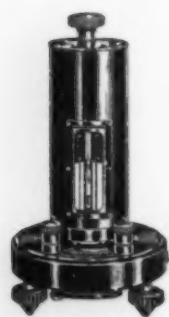
<sup>a</sup> Sensitivities at least as high as stated; other characteristics within 20%. Sensitivities stated assume that current in moving coil is in phase with current in field coil. Coil resistances include suspensions.



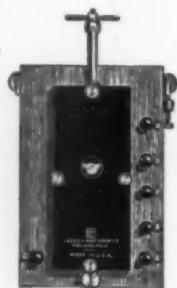
## A-C VIBRATION GALVANOMETERS

Instrument	List Number	Sensitivity (Per mm at 1 meter)*		Resonance Range, Per Cent		Resistance (Ohms)	Price	Refer to Catalog
		60 Cycles	3rd Harmonic	Cur- rent	Emf			
Vibration Galvanometer (For a-c measurements at commercial frequencies)	2350-a	0.025 $\mu$ a 500.0 $\mu$ v	111 $\mu$ a	0.3	1.5	800	\$150.00	ED Bul. No. 235
	2350-b	5.0 $\mu$ a 2.0 $\mu$ v	5,000 $\mu$ v	0.3	0.7	0.25	150.00	ED Bul. No. 235
Vibration Galvanometer (Similar to 2350, but equipped with remote tuning device)	2351-a	0.025 $\mu$ a 500.0 $\mu$ v	111 $\mu$ a	0.3	1.5	800	175.00	ED
	2351-b	5.0 $\mu$ a 2.0 $\mu$ v	5,000 $\mu$ v	0.3	0.7	0.25	175.00	ED

\* Sensitivities at least as high as stated; other characteristics within 20%.



2350  
(about  $\frac{1}{10}$  actual size)



2440  
(about  $\frac{1}{10}$  actual size)



2450  
(about  $\frac{1}{10}$  actual size)



2460  
(about  $\frac{1}{10}$  actual size)

## ASTATIC DYNAMOMETERS

Instrument	List Number	Watt Sensitivity (micro-watts)	Current Sensitivity (micro-amperes)*	Period (seconds)	Circuit	Total Resistance (ohms)	Total Inductance (milli-henrys)	Continuous Current Rating (amperes)	Price	Refer to Catalog
High-Sensitivity Astatic Dynamometer (For dielectric-loss and other watt-dynamometer measurements)	2440	5	0.05	10	Moving Coils Fixed Coils	200 125	15 110	0.05 0.1	\$275.00	ED
Astatic Dynamometer (For moderate sensitivity in educational and other laboratories)	2450	50	0.5	8	Moving Coils Fixed Coils	35 25	0.5 12	0.1 0.1	115.00	ED
Astatic Dynamometer with Enclosed Lamp and Scale (For many uses, including that of a null detector in measuring power factor of full-reel lengths of high-voltage cable)	2460	300	3	3	Moving Coils Fixed Coils	200 20	3.3 3.3	0.03 0.1	150.00	ED

\* Sensitivities at least as high as stated; other characteristics within 20%. Sensitivities (per mm at 1 meter for 2440 and 2450; per mm division for 2460) are with fixed coil circuit separately excited and carrying full current. Watt sensitivity assumes sufficient external resistance for 110 volts, that is, total resistance 1,100 ohms. On special order, we can furnish dynamometers built to specifications other than those above.

## THE ELECTRO-CHEMOGRAPH

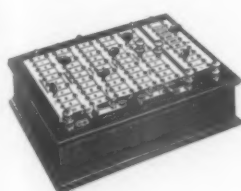
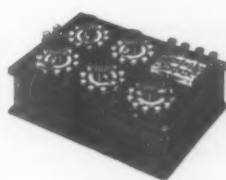
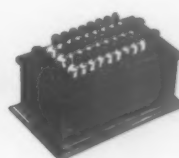
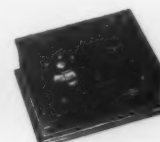
## For Quantitative and Qualitative Analysis By Determination of Current/Potential Relations

Any investigator with a problem in chemical analysis may wish to look into the possibilities of the dropping mercury electrode method . . . which permits quantitative as well as qualitative measurements, and is applicable to organic as well as inorganic analyses.

As made available in the L&N Electro-Chemograph, the dropping mercury electrode method is both accurate and rapid. Already installed in many university and industrial research laboratories, this versatile equipment is proving its usefulness in an ever-growing number of applications.

An assembly of standard L&N units, the equipment is reliable and accurate. Outstanding advantages of the L&N equipment include:

1. The operator sees the current/potential curve being inked.
2. The wide chart is easily, accurately read and is permanent.
3. Dark rooms, developing processes and delicate galvanometer systems are eliminated.
4. Instruments are made up of standard L&N mechanisms, proved reliable over years of use in other applications. Details are in Bulletin E-94(1).

4230  
(about 1/16 actual size)4725  
(about 1/16 actual size)4760  
(about 1/12 actual size)4250  
(about 1/12 actual size)4282  
(about 1/16 actual size)4270  
(about 1/10 actual size)

## A-C AND D-C BRIDGES

For general measurements of resistance and impedance, and for a number of specific quantities which can be measured in terms of resistance or impedance, we build a varied line of d-c and of a-c bridges. For many applications, you'll find a suitable, standard model . . . either among those here listed for research, teaching and testing; or among our industrial-type indicators, recorders and controllers. For unusual problems, we can either furnish a modified standard bridge or, if necessary, build a special one. Whether you have in mind a general or specific use, we are prepared to furnish the precision you desire in a well-made, reasonably-priced bridge which fits your need.

For specific work in laboratory, plant or field you will find a wide choice of models: for high or moderate precision; for table

use or portable; for general use or specialized. In some, all components are self-contained. Others comprise simply the bridge-arm elements. Still others are separate slidewires and ratio boxes which can be combined with other units to form various bridge assemblies.

In the design of these instruments, convenience and speed of manipulation have been given full consideration. Dials, plugs, keys and switches are easy to handle. Engraving and calibrated scales are legible. Binding posts for external connections are readily accessible. And, in building up this diversified line, we have made a real effort to keep the cost of each model consistent with its value to the user.

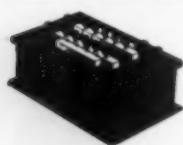
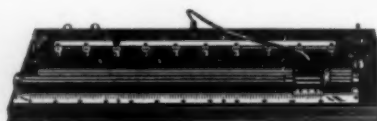
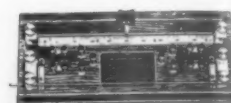
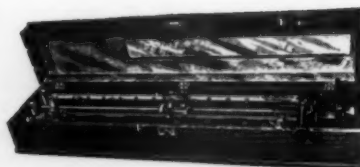
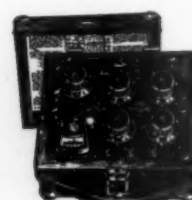
## WHEATSTONE BRIDGES

Instrument	List Number	Ratio Arms	Rheostat	Limits of Error	Price	Refer to Catalog
Anthony-Pattern Wheatstone Bridge (Highly precise standard for checking instruments and for general laboratory use.)	4230	Double set of ratio resistors; two each of 1, 10, 100, 1000, 10,000Ω. Plug and block connectors.	Range 0 to 11,111Ω, adjustable in steps of 0.1Ω, five decades of ten resistors each, respectively, 0.1, 1, 10, 100, 1000Ω. Plug and block connectors.	In ratio resistors = 0.01%; of 0.1Ω rheostat resistors = 0.05%; of all others = 0.02%.	\$650.00	E-53
Open-Dial-Switch Wheatstone Bridge (Conveniently, rapidly used bridge of high precision for general use.)	4725	Double set of ratio resistors; two each of 1, 10, 100, 1000, 10,000Ω. Plug and block connectors.	Range 0 to 10,000Ω, in steps of 0.1Ω, five decades 10 × 0.1 + 9(1 + 10 + 100 + 1000)Ω. Open-dial switches.	In ratio resistors = 0.025%; in rheostat arm, resistance change from zero setting of dials equals = (0.05% + 0.005Ω).	175.00	E-53
Enclosed-Switch Wheatstone Bridge (A compact, convenient bridge for moderate precision.)	4760	Seven multiplying values: 0.001, 0.01, 0.1, 1, 10, 100, 1000Ω. Enclosed-dial switch.	Range 0 to 9,999Ω, in steps of 1Ω, four decades 9(1 + 10 + 100 + 1000)Ω. Enclosed-dial switch.	In ratio resistors = 0.05%; in rheostat arm, resistance change from zero setting of dials equals = (0.1% + 0.01Ω).	55.00	E-53 EN-95
Post-Office Pattern Wheatstone Bridge (For student instruction.)	4250	Each has four resistors: 1, 10, 100, 1000Ω. Plug and block connectors.	Range 0 to 11,110Ω, in steps of 1Ω, 16 resistors, 1, 2, 3, 4, 10, 20, 30, 40, 100, 200, 300, 400, 1000, 2000, 3000, 4000Ω. Plug and block connectors.	In ratio resistors = 0.05%; in rheostat arm, resistance change from zero setting of dials equals = (0.1% + 0.01Ω).	60.00	E-53
Wheatstone Bridge Ohm-meter (A portable, slidewire-ratio bridge for rapid routine tests.)	4282	Slidewire approximately 12 inches, calibrated 0 to infinity.	Five standard resistors, respectively, 1, 10, 100, 1000, 10,000Ω. Plug and block connectors.	In standard resistors = 0.1%; in ratio values = 1% between 0.3 and 3; in resistance measurements = 1% between 0.3 and 30,000Ω.*	75.00	E-53
Per Cent Limit Bridge (For rapid inspection of resistors such as radio coils, magnetic windings, etc.)	4270	Range 0 to = 15%. Adjustable slidewires reading in % deviation from comparison standard for resistors of 1 to about 250,000Ω.	Uses standard comparison resistor.		50.00	E-53

\* Stated limits of error assume that the built-in standard will be selected which keeps the reading as near as possible to the center of the scale.

## KELVIN BRIDGES

Instrument	List Number	Ratio Arms	Comparison Standard	Range	Limits of Error	Price	Refer to Catalog
Precision Kelvin Bridge (For precise measurements of low resistance. Consists of two units: 4320 Ratio Box, and 4300 Adjustable Standard Low Resistance.)	4320 4300	Duplicate ratio arms, each including resistors of 100, 300, 400, 1000, 10,000Ω.	Nine fixed resistors each 0.001Ω and a 0.001Ω graduated bar having a scale of 110 divisions.	0.01 μΩ to 1Ω.	Of bridge = 0.04% down to 0.0001Ω; of ratio resistors = 0.015%; of fixed resistors = 0.04%; of graduated bar = 0.2 division.	\$400.00	E-53

4320  
(about 1/16 actual size)4300  
(about 1/16 actual size)4306  
(about 1/16 actual size)4340  
(about 1/16 actual size)4285  
(about 1/12 actual size)4286  
(about 1/12 actual size)4870  
(about 1/25 actual size)5430-A  
(about 1/6 actual size)5300  
(about 1/10 actual size)

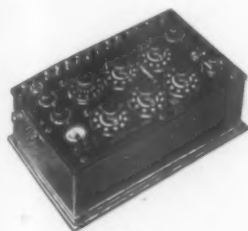
## KELVIN BRIDGES (Cont'd.)

Instrument	List Number	Ratio Arms	Comparison Standard	Range	Limits of Error	Price	Refer to Catalog
General Purpose Kelvin Bridge (For moderate precision in low-resistance measurements.)	4306	Seven settings: 0.1, 0.2, 0.5, 1, 2, 5, 10.	Nine fixed sections and a divided bar section each of 0.01Ω; scale has 100 divisions.	0.00001Ω to 1Ω.	In ratio resistors ±0.05%; of standard ±0.05%; of scale ±0.2 division.	\$200.00	E-53
Students' Kelvin Bridge (For teaching purposes.)	4340	Three settings: 0.1, 1, 10.	Bar, total resistance 0.01Ω; scale has 100 divisions.	0.00001Ω to 0.1Ω.	In ratio resistors ±0.2%; of standard ±0.5%; of scale ±0.5 division.	70.00	E-53 E-53(1)
Portable Kelvin Bridge (For low-resistance measurements of moderate precision in testing electrical materials.)	4285	Adjustable slidewires. Calibrated 1.5 to 2.66 and 1 to 1.6.	Dial switch. 0.0001, 0.0002, 0.0005, etc. up to 10Ω.	0.00001Ω to 26.6Ω.	±0.25% from 0.0005 to 26.6Ω; ±0.5% from 0.0001 to 0.0005Ω.	250.00	E-53
Kelvin Bridge Ohmmeter (A convenient portable bridge for low-resistance measurements in routine testing of windings, bars, rods, etc.)	4286	Adjustable slidewire. Calibrated 0.01 to 0.11.	Plug switch. 0.01, 0.1, 1, 10, 100.	0.0001 to 11Ω.	±2%.	120.00	E-53 EF22C
Hoopes Conductivity Bridge (For rapid routine comparison of wire and rod samples with standards of same material.)	4870	Adjustable to compensate for weight of sample. Calibrated ±15%.	4879 Copper Standard, calibrated according to International Annealed Copper Standard. Gauge Nos. 21, 18, 15, 12, 9, 6, 3 or 0, as specified, each for 3 consecutive gauge sizes.	0 to 115%.	±0.2%.	750.00	E-53

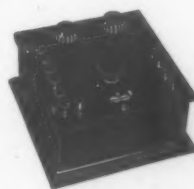
## FAULT LOCATING BRIDGES

Instrument	List Number	Ratio Arms	Rheostat	Limits of Error	Price	Refer to Catalog
Type U Test Set (A portable Wheatstone bridge especially adapted for locating faults in communication circuits.)	5430-A	Multiplying values of 1/1000, 1/100, 1/10, 1/9, 1/4, 1/1, 10/1, 100/1 for resistance measurements and for Varley Loop tests; also settings of M1000, M100, M10 for ratios in Murray Loop tests. Enclosed-dial switch.	Four decades 10 (1+10+100) + 9×1000Ω + infinity. Enclosed-dial switches.	In ratio resistors ±0.05%; in rheostat arm, resistance change from zero setting of dials equals dial readings ±(0.1% + 0.01Ω).	\$125.00	E-53 E-53-441(1)
Type S Test Set (A portable Wheatstone bridge for ordinary resistance testing and for locating faults in communication circuits.)	5300	Multiplying values of 0.001, 0.01, 0.1, 1, 10, 100, 1000 for resistance measurements and for Varley Loop tests; also settings of M1000, M100, M10 for ratios in Murray Loop tests. Enclosed-dial switch.	Four decades 9 (1+10+100+1000)Ω. Enclosed-dial switches.	In ratio resistors ±0.05%; in rheostat arm, resistance change from zero setting of dials equals dial readings ±(0.1% + 0.01Ω).	90.00	E-53 E-53-400(1)
Power Cable Fault Bridge (For locating faults in power cables, at low voltages, by the Murray Loop method.)	5365	Adjustable slidewire.	None.	Will carry normal test-current of 5 amps. continuously; 8 amps. for a short time.	240.00	E-53 E-53-441(4)

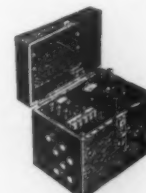




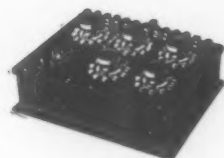
8069  
(about 1/20 actual size)



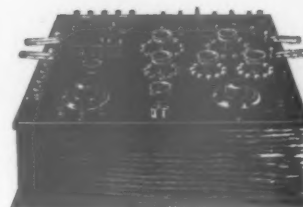
8063  
(about 1/12 actual size)



4960  
(about 1/16 actual size)



8067  
(about 1/16 actual size)



4666  
(about 1/16 actual size)

## TEMPERATURE BRIDGES

Instrument	List Number	Ratio Arms	Rheostat	Limits of Error	Price	Refer to Catalog
Type G-2 Mueller Bridge (For extremely high-precision temperature measurements by the electrical resistance-thermometer method.)	8069	Two ratio arms, 1000Ω each, adjustable to equality.	Range 0 to 111.111Ω in steps of 0.0001Ω. Three shunted decades giving steps of 0.0001, 0.001 and 0.01Ω; three decades of 0.1, 1 and 10Ω resistors. Principal shunted and decade resistors thermostatic to ±0.01°C near 35°C.	Resistance measurements within a few hundred thousandths of an Ω, or a few parts in a million, whichever is larger, provided a recently determined bridge calibration correction is applied.	\$1050.00*	E-33C (1)
Type G-1 Mueller Bridge (For precision temperature measurements by the electrical resistance-thermometer method.)	8067	Ratio arms, 500Ω each, adjustable to equality.	Range 0 to 51.111Ω in steps of 0.0001Ω. Three shunted decades giving steps of 0.0001, 0.001, 0.01Ω; two decades at end of ratio arms of 0.1 and 1Ω resistors, and binding posts on end of rheostat for connection to 0, 10, 20, 25, 25.5, 30 or 40-Ω resistors.	±0.02% or ±0.0001Ω, whichever is greater.	340.00	E-33C (1)
Resistance-Thermometer Bridge (For moderate-precision temperature measurements by the electrical resistance-thermometer method.)	8063	Ratio arms, 130Ω nominal.	Range 0 to 200.1Ω. Two dial decades 9(1+10)Ω, and a 100-Ω resistor removable by short-circuiting link, plus adjustable slidewire of 1.1Ω.	±0.005Ω up to 10Ω ±0.05% above 10Ω.	135.00	E
Portable Temperature Bridge (Similar to 8063, but portable.)	8062	Ratio arms, 130Ω nominal.	Same as 8063.	Same as 8063.	200.00	E
Portable Temperature Indicator (Primarily for body-temperature measurements, with 8153 Resistance Thermometer.)	8016	Ratio 1 to 1.	Adjustable slidewire calibrated 90 to 110°F for 100Ω nickel thermometer.	Of indicator ±0.1°F.	130.00	E

\* Calibration not included in list price. It is recommended that initial calibration be made by N.B.S. in accordance with their Schedule 114b... approximate cost, \$60.00 plus shipping charges to and from Washington, D. C. Subsequent calibrations by the

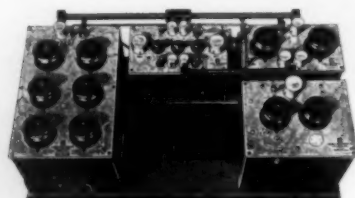
user, in accordance with directions supplied with instrument, require the use of an 8070 Calibrating Resistor... price \$25.00.

## CONDUCTIVITY BRIDGES

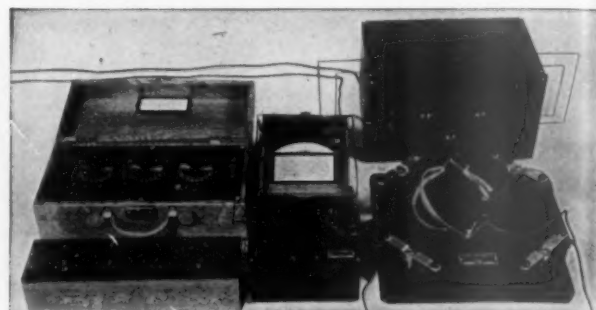
Instruments	List Number	Ratio Arms	Rheostat	Range	Limits of Error	Price	Refer to Catalog
Jones Conductivity Bridge (A laboratory standard a-c bridge primarily for extremely precise measurements of electrolytic conductivity.)	4666	Two 1000Ω resistors adjusted to equality of d-c resistance within ±0.01%. Slidewire between ratio resistors adjusts ratio arms to equality within ±0.0002% and provides range of ratio from 0.999 to 1.001.	See range. Capacitors included to balance residual.	60,000Ω in steps of 0.1Ω.	At 20 to 30°C and at relative humidity not over 70%, ±0.02%; with calibration corrections on resistors, above 100Ω, ±0.005% or better obtainable.	\$650.00*	EN-95 E
Portable Electrolytic Resistance Indicator (For general use in measuring the resistance of electrolytic solutions. Operates at 115 volts, 60 or 25 cycles.)	4960	Slidewire, direct reading in resistance.	Five standards: 1, 10, 100, 1000 and 10,000Ω.	0.3 to 30,000Ω.	±1% when built-in standards are selected to keep reading as near as possible to center of scale.	135.00	EN-95 E



9857  
(about  $\frac{1}{16}$  actual size)



1554-A2  
(about  $\frac{1}{50}$  actual size)



5337-A2; A1 is similar

### CONDUCTIVITY BRIDGES (Cont'd.)

Instrument	List Number	Ratio Arms	Rheostat	Range	Limits of Error	Price	Refer to Catalog
Portable Conductivity Resistivity Indicator (For general use in measuring the specific conductance and specific resistance of electrolytic solutions. Operates at 115 volts, 60 cycles.)	4866	Slidewire, direct reading in conductivity and in resistivity.	Five standards: 38, 380, 3800, 38,000, 380,000 $\Omega$ .	Specific conductance: 0.012 to 0.000,0001 mho per centimeter cube. Specific resistance: 80 to 10,000,000 $\Omega$ per centimeter cube.	$\pm 0.3\%$ of range.	\$275.00	EN-95 E
Portable Sugar Ash Indicator (For determining the ash content of raw sugars from the conductance of sugar solutions. Operates at 115 volts, 60 or 25 cycles.)	4961	Slidewire, direct reading in conductivity.	Five standards: 2, 20, 200, 2000, 20,000 $\Omega$ .	0.12 to 0.000,001 mho per centimeter cube. Corresponds to range 0.01 to more than 3% ash content of cane and beet sugar products.	$\pm 0.3\%$ of range.	\$50.00	EN-95 E

\* Adjustable capacitors, 50 to 1000  $\mu\text{mf}$  and 10 to 120  $\mu\text{mf}$  are supplied without calibration data. When specified, at time instrument is purchased, calibration data suitable for

measurements in terms of capacitance difference only will be supplied at an additional charge of \$20.00.

### FREQUENCY BRIDGES

Instrument	List Number	Ratio	Bridge Arms	Range	Limits of Error	Price	Refer to Catalog
Portable Frequency Indicators (Double-range impedance bridges.)	9857	Slidewire, direct reading in frequency.	Built-in mica capacitors and resistors.	58 to 62 and 24 to 25 cycles, for 115 volts.	$\pm 0.05$ cycle at normal frequency; $\pm 0.1$ cycle at limits of range.	\$250.00	E
	9858	Same as 9857.	Same as 9857.	58 to 62 and 48 to 52 cycles, for 115 volts.	Same as 9857.	\$50.00	E

### IMPEDANCE BRIDGES

Instrument	List Number	Ratio Arms	Comparison Standard	Range	Limits of Error	Price	Refer to Catalog
Shielded Capacitance and Conductance Bridge Assembly (A high-precision bridge for determining power factor and related a-c characteristics of dielectrics up to 50 kilocycles.)	1554-A2	1553 Shielded Ratio Box.	4764 Six-Dial Shielded Resistance Box; 1187 Adjustable Air Capacitor.	Of capacitance, 0-1300 $\mu\text{mf}$ , of conductance, 0-300 $\mu\text{mhos}$ .	Of capacitance $\pm 1 \mu\text{mf}$ , of conductance, depends on value.	\$895.00	E
Shielded Capacitance and Conductance Bridge Assembly (Moderate precision.)	1554-A1	Same as 1554-A2.	4750 Six-Dial Shielded Resistance Box; 1187 Adjustable Air Capacitor.	Same as 1554-A2.	Same as 1554-A2.	695.00	E
60-Cycle Owen Bridge Assembly (For determining permeability and core loss of magnetic core materials at inductions of 10 and 1,000 gauss at 60 cycles.)*	5337-A1	1 fixed capacitor and 2 fixed resistors.	1070 Mica Capacitor. A 1 $\mu\text{f}$ mica capacitor. 4745 Resistance Box.	Infinite.		755.00	E
1000-Cycle Owen Bridge Assembly (Similar to 5337-A1, but for tests at inductions of 10 gauss at 1000 cycles.)*	5337-A2	Same as 5337-A1.	Same as 5337-A1.	Same as 5337-A1.		765.00	E

\* A. S. T. M. A-258-43T.



1202  
(about  $\frac{1}{8}$  actual size)



1511-A1-A2  
(about  $\frac{1}{10}$  actual size)

### IMPEDANCE BRIDGES (Cont'd.)

Instrument	List Number	Ratio Arms	Comparison Standard	Range	Limits of Error	Price	Refer to Catalog
Schering Bridge Assembly (For measuring power factor and other dielectric characteristics of insulating materials. Maximum voltage 10 kv, 60 cycles.)	1511-A1	Fixed standard high-voltage air capacitor for one, and test specimen for other.	Adjustable air capacitor [range, 10 (0.1 + 0.01 + 0.001 + 0.0001 $\mu$ f) + 110 $\mu$ f] for power factor readings, and adjustable decade resistors [range, 10(0.1 + 1 + 10 + 100 + 1000 $\Omega$ ) + 0.105 $\Omega$ ] for capacitance readings.	Capacitance: 40 $\mu$ f to 0.02 $\mu$ f using 100 $\mu$ f standard, 10 kv air capacitor. Power Factor: 0.0001 to 0.70.	Capacitance: $\pm 0.25\%$ exclusive of the error of the high-voltage air capacitor. Power Factor: $\pm 0.000,005$ for power factor of 0.0001 when capacitance of specimen is at least 100 $\mu$ f and applied voltage not less than 3000 volts. $\pm 0.005$ for power factor of 0.5.	\$2314.00	E-54 (2) E
Schering Bridge Assembly (Similar to 1511-A1, but maximum voltage 25 kv, 60 cycles.)	1511-A2	Same as 1511-A1.	Same as 1511-A1.	Same as 1511-A1.	Same as 1511-A1.	2514.00	E-54 (2) E
Farad Bridge (For comparing capacitances with self-contained standard capacitors.)	1202	Slidewire with 12-inch scale calibrated 0 to infinity.	Three standard mica capacitors, 0.001, 0.01 and 0.1 $\mu$ f.	0.0003 to 1 $\mu$ f.	Between 0.0003 and 0.003 $\mu$ f, and between 0.3 and 1 $\mu$ f, $\pm 3\%$ . Between 0.003 and 0.3 $\mu$ f, $\pm 1$ to $\pm 2\%$ .	80.00	E
Capacitance Limit Bridge (For rapid inspection of capacitors. Operates on 115 volts, 60 cycles.)	1206	Adjustable tap transformer reading in per cent deviation from comparison standard.	External comparison capacitor used, having capacity of 10 $\mu$ f to 5 $\mu$ f. Not included in list price.	0 to $\pm 30\%$ of standard.		15.00	E

### A-C AND D-C BRIDGE ACCESSORIES

#### D-C RATIO BOXES \*

4392 WENNER RATIO BOX. For precise comparison of resistors of the same nominal value. Shows deviation from standard in parts per million. One ratio arm a fixed resistance of 100 ohms. Other arm adjustable between 99.445 and 100.555 ohms in steps of 0.001 ohm .....\$215.00

4391 L&N RATIO BOX. For precise standardizing of resistors. Shows magnitude of unknown resistance in per cent of standard. Range 99.000 to 101.110 per cent in steps of 0.001 per cent. Compares resistors of same nominal value or in a ratio of 10:1 .....\$195.00

#### A-C RATIO BOX \*

1553 CAMPBELL-SHACKELTON SHIELDED RATIO BOX. For a variety of impedance bridges. Com-

\* Further information in Catalog E.

prises a pair of accurately matched 1000-ohm resistors, a shielded transformer and auxiliary resistors and capacitors for adjusting initial balance .....\$170.00

#### OSCILLATORS AND AMPLIFIERS \*

9842 VACUUM TUBE AUDIO FREQUENCY OSCILLATOR. For 500, 1000 and 2000 cycles. Operates on 115 volts, 60 cycles .....\$190.00

9847 TUNED AUDIO FREQUENCY AMPLIFIER. For 500, 1000 and 2000 cycles. Operates on 115 volts, 60 cycles .....\$125.00

9846 TUNED AUDIO FREQUENCY AMPLIFIER. Same as 9847, but adapted for mounting on 19-inch telephone relay rack .....\$135.00

9848 COMMERCIAL FREQUENCY AMPLIFIER. For amplification at 25 or 60 cycles .....\$260.00

9850 AUDIO FREQUENCY GENERATOR. Delivers current of fair wave form at 1000 cycles. Operated by 115-volt motor .....\$150.00

9856 MICROPHONE HUMMER. Delivers current of fair wave form at 1000 cycles. Operates on 6 dry cells .....\$34.00

#### TELEPHONE RECEIVERS \*

9871 TUNABLE TELEPHONE RECEIVER. Total d-c resistance 120 ohms. Double receiver with headband .....\$20.00

9872 TELEPHONE RECEIVER. Total d-c resistance 2000 ohms. Double receiver with headband..\$5.50

9873 TELEPHONE RECEIVER. Total d-c resistance 130 ohms. Double receiver with headband..\$12.00

9874 TELEPHONE RECEIVER. Impedance at 1000 cycles, 30,000 ohms. Double receiver with headband .....\$20.00



## POTENTIOMETERS

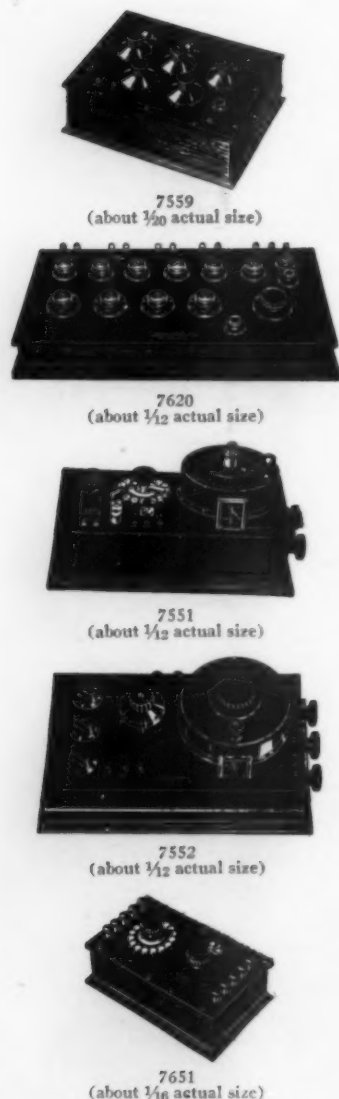
To determine emf as precisely as a given measurement demands, you can choose from a well-rounded line of L&N instruments, each of which applies the basically-sound potentiometer principle in a thoroughly reliable construction.\* Designs, materials and workmanship are the results of years of extensive experience, during which we have had the close cooperation of leading scientists in developing potentiometers to meet the various needs of research, teaching and testing. Adjustments of slidewire uniformity, of resistor equality and of each potentiometer as a whole are made within conservatively safe limits. Each is a well-built, thoroughly-tested assembly on which the user can depend for full stability and reproducibility of measurements made within error limits which are definitely guaranteed. Each embodies accuracy, sensitivity and readability in such proportion that the precision guaranteed is readily attainable.

From the simplest model to the most precise, each L&N potentiometer is, in its intended service, a strikingly convenient instrument to use. Well-placed, easy-to-grip controls enable the operator, while balancing the potentiometer, to keep an uninterrupted eye on his galvanometer reading device. Auxiliary keys, switches and knobs are simplified, handy. Standard cell can be applied quickly and easily. Binding posts are readily accessible, but so located that, while the instrument is in use, external connections are out of the operator's way.

The earned reputation which attaches to every L&N potentiometer arises out of the fact that each, in its field, is built to give the required precision, with maximum convenience and speed of manipulation, at a cost in keeping with its value to the user.

\* "Design of Potentiometers," I. M. Stein, A.I.E.E. Transactions, Vol. 50, No. 4, 1931.

## D-C NULL POTENTIOMETERS



Instrument	List Number	Range	Limits of Error	Price	Refer to Catalog
Wenner Thermocouple Potentiometer (For highly precise measurements of low voltages; primarily for thermocouple work.)	7559	High: 0 to 0.11111 volt in steps of 1 $\mu$ v. Low: 0 to 0.011111 volt in steps of 0.1 $\mu$ v.	High range: $\pm (0.01\% + 0.5 \mu\text{v})$ . Low range: $\pm (0.01\% + 0.1 \mu\text{v})$ .	\$1245.00*	E-33A(1) E
Wenner Standardizing Potentiometer (Similar to 7559, but for higher voltages.)	7558	High: 0 to 1.9111 volts in steps of 10 $\mu$ v. Low: 0 to 0.19111 volt in steps of 1 $\mu$ v.	High range: $\pm (0.01\% + 5 \mu\text{v})$ . Low range: $\pm (0.01\% + 1 \mu\text{v})$ .	1070.00*	E
White Single Potentiometer (For precision temperature measurements in calorimetry and other low-voltage applications.)	7620	0 to 0.01 volt in steps of 1 $\mu$ v.	$\pm (0.02\% + 0.5 \mu\text{v})$ .	500.00	E-33A(2) E
White Single Potentiometer (Same as 7620, except for greater range.)	7621	0 to 0.1 volt in steps of 10 $\mu$ v.	$\pm (0.02\% + 1 \mu\text{v})$ .	500.00	E-33A(2) E
White Double Potentiometer (Has two sets of measuring dials, controlled by a master switch, so that two widely different temperatures may be measured without resetting dials.)	7622	0 to 0.01 volt in steps of 1 $\mu$ v.	$\pm (0.02\% + 0.5 \mu\text{v})$ .	800.00	E-33A(2) E
White Double Potentiometer (Has two sets of measuring dials, controlled by a master switch, so that two widely different temperatures may be measured without resetting dials.)	7623	0 to 0.1 volt in steps of 10 $\mu$ v.	$\pm (0.02\% + 1 \mu\text{v})$ .	800.00	E-33A(2) E
Type K-1 Potentiometer (A double-range precision potentiometer for general laboratory use.)	7551	High: 0 to 1.61 volts; Low: 0 to 0.161 volt.	When using 3 or more switch studs: low range 0.02%, high range 0.01%.	250.00	E-50B(3) E EN-96
Type K-2 Potentiometer (A triple-range precision potentiometer for general laboratory use. Additional low range especially useful for thermocouple work, and for checking industrial potentiometer pyrometers. Special terminals provide fixed potentials for checking lab-standard wattmeters. Improved controls make operation easier.)	7552	High: 0 to 1.61 volts; Medium: 0 to 0.161 volt; Low: 0 to 0.0161 volt.	When using 3 or more switch studs: high range 0.01%, medium and low ranges 0.015%.	300.00	E-50B(3) E EN-96
Students' Potentiometer (A simplified, moderate-precision potentiometer for educational and general laboratory use.)**	7651	High: 0 to 1.6 volts. Low: 0 to 0.016 volt.	Dial resistors and total slidewire resistance alike within $\pm 0.04\%$ ; slidewire uniform within $\pm 0.5$ division.	70.00	E-50B(1) EN-96 E

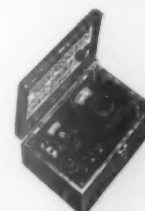
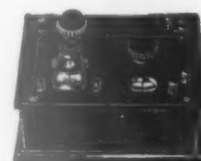
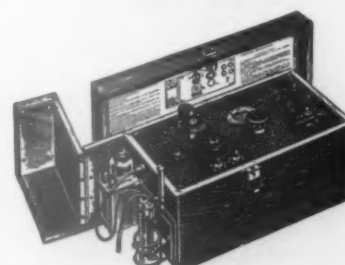
\* Price includes N.B.S. Certification.

\*\* Separate connections to slidewire and end coils provided, so that slidewire of 7651 can be used in an a-c bridge.

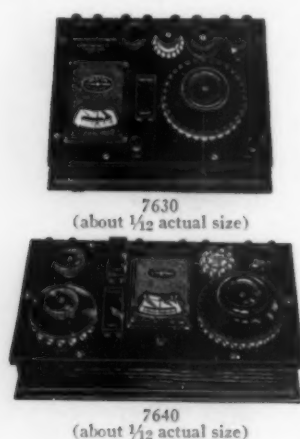
## NULL POTENTIOMETERS (Cont'd.)

Instrument	List Number	Range	Limits of Error	Price	Refer to Catalog
Portable Millivolt and Temperature Indicator (For precise checking of thermocouple pyrometers in laboratory and plant, and for general temperature measurements. Used with noble-metal and base-metal couples. Range calibrated on dial switch and slidewire.)	8662	High: 0 to 80.5 mv. Low: 0 to 16.1 mv. Reference-junction compensators: 0 to 1 mv, adjustable to 0.002 mv; 0 to 5 mv, adjustable to 0.01 mv. Either compensator may be used with either main range.	Low main range and low-range compensator, $\pm 0.01$ mv. Low main range and high-range compensator $\pm 0.02$ mv. High main range and either compensator, $\pm 0.05$ mv.	\$225.00	E-33A-503 E
Portable Millivolt Indicator (Convenient for pH and other emf measurements. Range calibrated on dial switch and slidewire.)	7655	0 to 1.110 volts. Double and triple range instruments supplied on special order.	$\pm 0.001$ volt.	140.00	EN-96 E
Portable Millivolt and Temperature Indicator (For checking thermocouple pyrometers in the laboratory, and for general temperature measurements. Range calibrated on dial switch and slidewire. Used primarily with base-metal couples.)†	8667	0 to 111 mv.	$\pm 0.1$ mv.	140.00	E-33A-503 E
Portable Millivolt and Temperature Indicator (For checking thermocouple pyrometers in the plant, and for general temperature measurements. Used with noble-metal and base-metal couples. Range calibrated on slidewire only.)	8657-C	Low: 0 to 16 mv. High: 16 to 64 mv. Reference-junction compensators: 0 to 1 mv; 0 to 5 mv. Either compensator may be used with either main range.	Low main range with either compensator, $\pm 0.05$ mv. High main range with either compensator, $\pm 0.15$ mv.	145.00	E-33A-503 E
Portable Millivolt and Temperature Indicator (Same as 8657-C, except main ranges and compensator ranges in millivolts, as specified.)	8657-X	As specified.	Same as 8657-C.	155.00	E-33A-503 E
Portable Millivolt and Temperature Indicator (For checking thermocouple pyrometers in the plant, and for general temperature measurements. Used principally with noble-metal couples. Range calibrated on slidewire only.)	8656-B	0 to 16 mv. Reference-junction compensator: 0 to 1 mv.	$\pm 0.05$ mv.	120.00	E-33A-503 E
Portable Millivolt and Temperature Indicator (For checking thermocouple pyrometers in the plant, and for general temperature measurements. Used principally with base-metal couples. Range calibrated on slidewire only.)	8656-D	0 to 70 mv. Reference-junction compensator: 0 to 5 mv.	$\pm 0.23$ mv.	120.00	E-33A-503 E
Portable Millivolt and Temperature Indicator (Same as 8656-B, except main range and compensator range in millivolts or temperature, as specified.)	8656-X	As specified.	Same as 8656-B.	125.00	E-33A-503 E
Portable Millivolt and Temperature Indicator (For body-temperature measurements with hypodermic and skin-surface thermocouples.)	8663-CD	25 to 125 F. and -3.9 to +51.7 C for iron and constantan thermocouples. Reference-junction compensator automatic.	Of indicator only: $\pm 0.5$ F.	155.00	E-33-423 E
Quinhydrone pH Indicator (A simple, convenient potentiometer for routine measurements with the quinhydrone electrode.)	7654	-0.400 to +0.100 volt and 1 to 9 pH at 25 C.	$\pm 0.0025$ volt $\pm 0.04$ pH	50.00	EN-96 E
Universal pH Indicator (A compact, portable instrument which combines laboratory accuracy and sensitivity with speed and convenience. Direct-reading with its own self-contained glass electrode or with quinhydrone, hydrogen gas or any other electrode following the Nernst equation.)	7663	0 to 13 pH in 0.1 pH divisions. 0 to $\pm 1.100$ volts in 0.01 volt divisions. Temperature compensator range 0 to 50 C in 1 C divisions.	pH scale, $\pm 0.05$ pH (exclusive of any error in stated pH of buffer solution). Voltage scale, $\pm 0.0037$ volt. Error due to control current, less than 0.002 volt per 1000 meg-ohms in measured circuit. Reproducibility, 0.02 pH.	240.00	E-96(3) E

† Does not have reference-junction compensator. Use of ice bath is recommended for reference junction.

8662  
(about 1/24 actual size)7655  
(about 1/20 actual size)8657-C  
(about 1/12 actual size)7654  
(about 1/10 actual size)7663  
(about 1/12 actual size)7662  
(about 1/12 actual size)

## DEFLECTION POTENTIOMETERS



Instrument	List Number	Range	Limits of Error	Price	Refer to Catalog
Glass-Electrode pH Indicator (Deflection instrument but not potentiometer type.)	7652	0 to 8 pH and 6 to 14 pH.	$\pm 0.1$ pH 'exclusive of any error in pH of standardizing buffer solution).	\$160.00	E-96(2)
Brooks Model 7 Deflection potentiometer (For rapid testing of ammeters, voltmeters and wattmeters.)	7630	0 to 150 mv.	For combined null and deflection readings, $\pm (0.02\% + 0.03 \text{ mv})$ .	425.00	E-50B(2) E
Brooks Model 8 Deflection Potentiometer (For measuring voltage and current in lamp-efficiency testing.)	7640	0 to 1.5 volts.	For combined null and deflection readings, $\pm (0.02\% + 0.3 \text{ mv})$ .	575.00	E-50B(2) E

## PRIMARY ELEMENTS, ACCESSORIES, SUPPLIES

We are prepared to furnish complete laboratory measuring equipments. In addition to the Standards, Galvanometers, Bridges and Potentiometers listed above, the L&N line includes the various additional units and accessories often needed.

For various applications there is a wide choice of primary elements: for temperature—thermocouples, Rayotubes, resistance thermometers; for pH—glass, calomel, hydrogen, etc. electrodes; for electrolytic conductivity—laboratory and industrial conductivity cells.

Accessories are supplied for use specifically with galvanometers and dynamometers. Devices are available for mounting a galvanometer on a tripod, on a table, or on a wall. There is a choice of devices for reading galvanometer deflections with a plane mirror and

a convex lens or with a concave mirror; also scales with lamps and telescopes—including a lecture room lamp and scale for demonstrating galvanometer deflections to a large assembly. As voltage source for illumination, an a-c transformer or a d-c resistance unit is used. For use as current dividers, Ayrton shunts in a choice of total resistances are available. For damping a galvanometer or for protecting a galvanometer, standard cell or other instrument against excessive current, a choice of mounted resistors is supplied.

If the user prefers to assemble a bridge from separate units, the 4261 Circular Slidewire or the 4258 Kohlrausch Slidewire is available and the 7651 Students' Potentiometer is equipped with binding posts by means of which its slidewire can be used in a conductivity bridge assembly.

For making up a variety of a-c bridge assemblies, the Campbell-Shackelton A-C Ratio Box is available; for d-c bridge assemblies, an L&N Ratio Box or a Wenner Ratio Box is supplied.

Accessories for impedance measurements at power or audio frequencies include amplifiers; oscillators; phones or galvanometers for use as balance-point detector.

Where potentiometers are used, we supply a complete line of volt boxes and shunts. With either a null or deflection potentiometer when voltage above the nominal range of the instrument is measured, a suitable volt box may be used.

Specific literature describing primary elements, accessories and supplies not listed here is available on request.

## MISCELLANEOUS LABORATORY APPARATUS

## TRANSFORMER TESTING APPARATUS \*

**7190-A POTENTIAL TRANSFORMER TEST APPARATUS** Primary apparatus for laboratory tests. Range 0 to 15,000 volts. Galvanometer not included in price .....\$2500.00

**7160 POTENTIAL TRANSFORMER TEST SET.** For testing potential transformers in service or in the laboratory. Ratio range 95 to 105%. Limit of error  $\pm 0.1\%$  ratio. Phase-angle range, 2 degrees lagging to 2 degrees leading; limit of error  $\pm 5$  minutes. Operates on 115 volts, 60 or 25 cycles. Includes galvanometer .....\$250.00

**7173 THREE-PHASE PHASE SHIFTER.** For use with 7160 and 7150 .....\$200.00

**10621 PHASING TRANSFORMER.** For operating 7173 Phase Shifter on two-phase .....\$50.00

**7180-A CURRENT TRANSFORMER TEST APPARATUS** Primary apparatus for laboratory tests. Range 0 to 1000 amperes. Galvanometer not included in price .....\$2320.00

**7181-A CURRENT TRANSFORMER TEST APPARATUS.** Similar to 7180-A, but range 0 to 2500 amperes .....\$3480.00

**7182-A CURRENT TRANSFORMER TEST APPARATUS.** Similar to 7180-A, but range 0 to 5000 amperes .....\$4830.00

\* Further information in Catalog E.

**7150 SILSBEE CURRENT TRANSFORMER TEST SET.** For testing current transformers in service or in the laboratory. Similar to 7160 .....\$350.00

**7156 SET OF ADJUSTABLE BURDENS.** Provides impedance when instrument transformers cannot be tested with working burdens. Resistance range 2 ohms, adjustable in steps of 0.04 ohm. Inductance range 5 millihenrys, adjustable in steps of 0.1 millihenry .....\$475.00

## DIELECTRIC PROPERTIES TESTING APPARATUS \*

**1510-A1 POWER FACTOR MEASURING ASSEMBLY.** Primarily for high-voltage production testing of cable in reel lengths to determine power factor of insulation by the phase-defect compensation method .....\$1984.00

**1512-A1 BUSHING TEST SET.** For field tests of bushings and insulators. Also measures capacitance and power factor of small cable lengths, insulating compounds, oils and other dielectric materials. Operates on 115 volts, 60 cycles.\*\* Reads directly in capacitance and power factor or cotangent values .....\$2600.00

**5602-A2 GUARDED INSULATION-RESISTANCE TEST ASSEMBLY.** For accurate measurements of insulation resistance, in plant or test room. Designed to conform to A.S.T.M. D-257. ....\$346.00

\*\* Bushing Test Set can be supplied for operation on 115 volts, 25 cycles. Specifications and prices on request.

5602-A1 GUARDED INSULATION-RESISTANCE TEST ASSEMBLY. Similar to 5602-A2, but designed specifically for research in laboratory testing where greater degree of sensitivity may be desired .....\$346.00

**5378 PORTABLE INSULATION-RESISTANCE TEST SET.** For laboratory and field measurements of insulation resistance .....\$125.00

**5384 PORTABLE INSULATION AND CAPACITANCE TEST SET.** For field measurements of insulation resistance and capacitance .....\$300.00

## MISCELLANEOUS APPARATUS

**THERMAL TRANSFORMATION POINT APPARATUS.** For testing steel samples to locate temperatures at which metallurgical transformations occur. Details and price on request.

**42200-A1 ELECTRO-CHEMOMETER.** For dropping-mercury cathode method of chemical analysis. Further details in Technical Publication E-94(1). ....\$750.00

**6700-A KNORR-ALBERS MICROPHOTOMETER.** For spectrographic analysis. Automatically scans spectrographic plates or films and draws line-density records on wide strip-chart .....\$3750.00



# Weston Electrical Instrument Corporation

601 FRELINGHUYSEN AVENUE, NEWARK, N. J.

## — WESTON INSTRUMENTS — *The Standard for* INSTRUCTION • RESEARCH • INDUSTRY

Weston Instruments are the accepted standard of dependable measurement in educational institutions, scientific laboratories and throughout Industry. Educators know that the student years are the impressionable years. Exacting standards learned then will ultimately bear fruit in electrical progress during graduates' engineering careers and add to the prestige of the schools. The models listed and described are extensively used in schools and can be furnished in all practical ranges. Information on the complete Weston line sent promptly on request.

### PORTABLE AND PANEL INDICATING INSTRUMENTS

Ammeters, Voltmeters, Wattmeters,  
Galvanometers, Microammeters,  
Ohmmeters, Microfarad Meters

### INSTRUMENT TRANSFORMERS

Potential and Current

### RELAYS

Sensitive and Power Uses — Current  
and Voltage Types

### ELECTRIC TACHOMETERS

A.C. and D.C. Types — Remote  
Indicating

### LABORATORY STANDARDS

Voltmeters, Ammeters, Wattmeters

### SPECIALIZED TESTING EQUIPMENT

Power Analyzer, Industrial Analyzer,  
Clamp Ammeter, Photoelectric Potentiometer, Battery Testing Instruments

### SERVICE EQUIPMENT

Tube Checkers, Analyzers, Ohmmeters

### \*PHOTOELECTRIC CELLS AND CONTROL DEVICES

"Photronic" Cells — Dry Disc Type  
Photoelectric Control Devices

### LIGHT MEASURING DEVICES

Illumination Meter, Foot Candle Meters,  
Sight Meter, Exposure Meters

### TEMPERATURE INDICATING INSTRUMENTS

Electrical Type — Remote Indicating  
Bimetallic Dial Type — Laboratory,  
Industrial

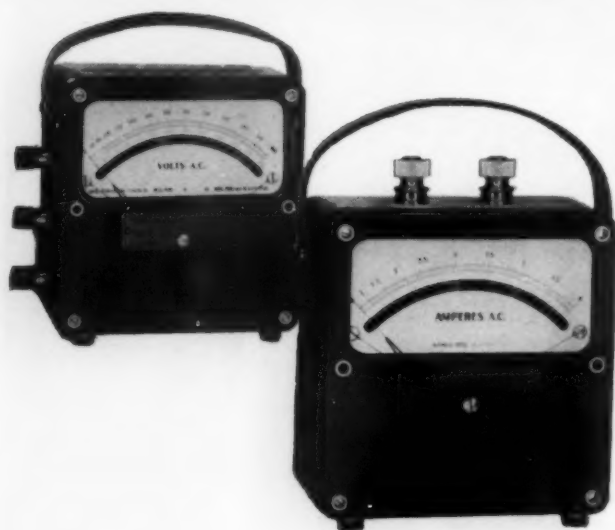
### STANDARD CELLS

\*Photronic — A registered trademark  
designating the photoelectric cells and  
photoelectric devices manufactured exclusively by the Weston Electrical Instrument Corporation.





# Instruments for Every Classroom



Model 430

## Portable AC and DC

Voltmeters • Ammeters • Single Phase Wattmeters

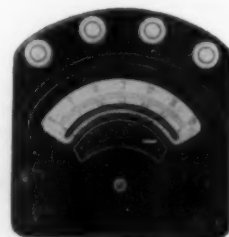
Extensively used in technical schools and throughout industry for general test work, because they are extremely compact, and combine unusual ruggedness with dependable accuracy. The unusually large scale opening permits good visibility of the long hand calibrated mirror scales with knife edge pointers. Contained in molded Bakelite cases provided with leather carrying strap. Size approximately 5-1/16" x 6-1/32" x 3-1/2". Weight approximately 3-1/2 lbs.



Model 622

### DC Ultra-Sensitive Microammeters Millivoltmeters

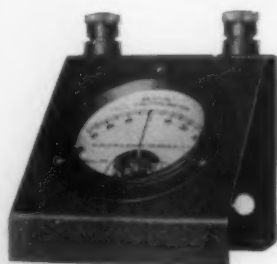
A group of high-sensitivity instruments requiring no leveling. Ideal for precision measurement of potentials and minute currents involving electronics, thermo-couples or laboratory research. Low ranges down to 5 microamperes statically shielded. Ranges up to 20 microamperes magnetically and statically shielded.



Model 280

### Miniature DC Instruments

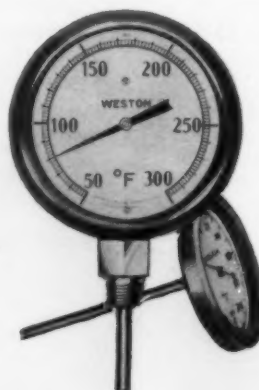
Available in single and multi-range, portable models which are most convenient for student use on a variety of testing. Features are: 1% accuracy, ruggedness, hand calibrated mirror scales, knife edge pointers and magnetic shielding. Size 4-2/5" x 4-3/5" x 1-1/2".



Model 375

### Student Galvanometer

Made in two models, with or without mounting base. Widely used in school laboratories where dependability and low cost are first considerations. Sensitivity is 22 microamperes. Resistance 23 ohms. Models also available where medium or extreme sensitivity is required.



### TEMPERATURE GAUGES

#### Laboratory and Industrial Types

Weston all-metal temperature gauges have large gauge-type scales which provide extreme readability, even at a distance. The laboratory model is guaranteed accurate within 1/2 of 1% over full scale and the industrial types within 1% of full scale. As there are no fragile parts, accuracy is maintained over far longer periods and they withstand vibration and accidental breakage.

# and Laboratory Requirement



Model 785

## DC-AC Industrial Circuit Tester

Ultra-Sensitive • 27 Ranges

A low current-drain instrument for industrial arts laboratories and shops. Designed to perform a wide range of precision electrical measurements of currents, voltages and resistances. It has a sensitivity of 20,000 ohms per volt for DC and 1000 ohms per volt for AC. Especially useful for checking and trouble-shooting on electronic devices, sensitive relays, oscilloscopes and other apparatus with critical electrical settings. Comes equipped with test leads; also self-contained battery to provide potentials for resistance readings. Furnished in a sturdy, portable case with test lead compartment and removable cover.



Model 697  
Volt • Ohm  
Milliammeter  
AC • DC



Provides a carefully selected group of ranges for most requirements for measuring AC and DC voltages, direct current and resistance values. Sensitivity 1000 ohms per volt. Self-contained battery provides potentials for resistance measurements. Comes equipped with test leads for insertion in pin jacks on panel. Size 5-9/16" x 3-3/4" x 3-9/16". Approx. weight 1-3/4 lbs.

Model 564

### DC Volt-Ohmmeter



Model 564 is somewhat similar in appearance to Model 697 and will appeal to school heads where testing and experimentation require only DC voltage or resistance measurements. The ranges have been carefully planned to provide the electrical measurements frequently needed for student instruction. Size approximately 4-1/2" x 3-5/8" x 3-9/16". Approximate weight 1-3/4 lbs.

Model 594—Type 3  
Phototronic Cell



Weston Phototronic cells are of the barrier-layer, self-generating type. They combine stability with high sensitivity, and freedom from fatigue. Can be safely operated up to temperatures of 140°F. Bakelite case and threaded terminals are standard equipment; can also be supplied with weather-proof housing and prongs for UX socket.

Model 633

### AC Clamp Ammeter



Readings are speedily taken with this compact circuit checker simply by closing the rubber-covered jaws around an insulated or non-insulated conductor. No hook-ups necessary, no interruption of circuit. Six ranges available through convenient thumb switch. Simple and safe for student use. No shorting of adjacent conductors.



## WESTON PANEL INSTRUMENTS

Design instructors will appreciate the wide selection of Weston panel instrument models. They will fill every requirement for attractive appearance, utility and dependable measurement.



### Model 801 Group — Rectangular

Exceptional scale length, readability, and ease of mounting are the features of this general purpose group. Made in all types and ranges for practical AC and DC use. Cases are black, semi-flush Bakelite 4-1/4" x 3-15/16". Scale length 3.17".



### Model 640 Group — Round

A line of AC and DC instruments available in all practical ranges. Standard case is 4-3/8" dia., flush Bakelite. Surface Bakelite and flush or surface metal cases are optional. Scale length 3.34".



### Model 301 Group Round or Rectangular

A group of compact AC and DC panel instruments, measuring approximately 3-3/8" dia., available in all required types and ranges. Round shapes furnished with flush Bakelite cases. Rectangulars, flush or surface in either Bakelite or metal.



### Model 269 Group — Fan Shape

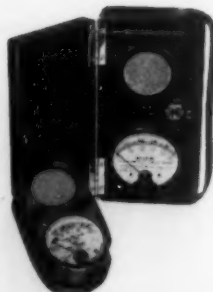
A very attractive group of wide range DC instruments with the longest scales ever attained for comparable sizes. Accuracy 1%. Available in four scale lengths 2.6"—4"—5.8"—7.32"; and supplied in surface types, black finished steel cases.

## WESTON ILLUMINATION METERS

### Weston Illumination Meters

Model 703, pocket size and entirely self-contained. Measures directly in foot-candles, range 0-75 fc. Available with Viscor filter for measuring all types of lighting direct, regardless of color characteristics.

Model 614, has three ranges, available through range changing switch . . . 0-60/0-120/-0-600/foot candles. Also available with the Viscor filter as described above.



### BRANCH OFFICES

NEW YORK, Weston Electrical Inst. Corp. . . . . 50 Church St.  
CHICAGO, Weston Electrical Inst. Corp. . . . . 205 W. Wacker Dr.

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BOSTON, Cowperthwait & Brodhead . . . . . 126 Newbury St.  
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CINCINNATI, Beedle Equipment Co. . . . . 406 Elm St.  
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DALLAS, T. C. Ruhling Co. . . . . 5020-22 Bradford Dr.  
DENVER, Peterson Company . . . . . 1925 Blake St.  
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JACKSONVILLE, Ward Engineering Co. . . . . 302 Hildebrandt Bldg.  
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MONTREAL, QUE., Powerlite Devices, Ltd. . . . . 807 Keefer Bldg.  
REGINA, SASK., Northern Electric Co., Ltd. . . . . 2300 Dewdney Ave.  
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WINNIPEG, MAN., Northern Electric Co., Ltd. . . . . 65 Rorlie St.

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BOSTON, A. S. Mancib . . . . . 26 Wallace St., Somerville  
BUFFALO, Electrical Instrument Labys . . . . . 1542 Hertel Ave.  
CHICAGO, Illinois Testing Labys . . . . . 420 No. La Salle St.  
CLEVELAND, Christie Labys, Inc. . . . . 616 St. Clair Ave.  
DENVER, Meter Service, Inc. . . . . 726 12th St.  
DETROIT, Electrical Inspec. & Serv. Co. . . . . 508 United Art Bldg.  
LOS ANGELES, Quality Elec. Co., Ltd. . . . . 1235 E. Olympic Blvd.  
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SAN FRANCISCO, Pacific Elec'l Inst. Labys . . . . . 420 Market St.  
SYRACUSE, Syracuse Inst. Labys . . . . . 168 E. Matson Ave.  
TACOMA, G. G. Michell . . . . . 1025 So. 62nd St.  
TORONTO, ONT., CAN., Powerlite Devices, Ltd. . . . . 171 John St.

# Weston Electrical Instrument Corporation

601 FRELINGHUYSEN AVENUE, NEWARK, N. J.

# C-O-TWO FIRE EQUIPMENT COMPANY

Newark 1, New Jersey

SALES AND SERVICE IN ALL PRINCIPAL CITIES AND IN CANADA

## Carbon Dioxide Fire Extinguishing Equipment IT'S SAFER because IT'S FASTER

C-O-TWO carbon dioxide fire equipment is particularly adaptable for the protection of cafeterias, domestic science kitchens, manual training, woodworking, electrical, machine shops, laboratories and wherever flammable liquids are used or stored. C-O-TWO gas kills fire in seconds without damage to materials or equipment.

### C-O-TWO KILLS FIRE — SAVES LIFE!

WHAT IS C-O-TWO?—Carbon Dioxide is a clean, pure, dry, odorless and non-damaging inert gas. It is the fastest and most efficient of modern fire extinguishing agents.

C-O-TWO Extinguishers smother fire instantly under a heavy, dense, blanket of Carbon Dioxide Gas. One of Carbon Dioxide's most valuable properties is its high ratio of expansion (450 to 1). When liberated, the gas is discharged under its own pressure without pumping and by the force of its own expansion it penetrates every nook and corner, even seeking out cracks and crevices where fire might lurk. It reaches all out-of-the-way places which cannot be reached by other extinguishing agents. It is equally effective when used indoors or outdoors, and is not affected by temperature and does not deteriorate.

Carbon Dioxide will not damage or injure machinery, equipment, woodwork, finishes, fabrics or materials with which it may come in contact. It is a non-conductor of electricity, which is an added safety feature to fire fighting.

The design of C-O-TWO equipment eliminates any possibility of freezing in cylinders, valves, discharge hose, horn, nozzles or piping.

Carbon Dioxide has many commercial uses, and C-O-TWO refills are obtained quickly and conveniently from direct factory branches and recharging plants located in practically every large city and seaport throughout the world.

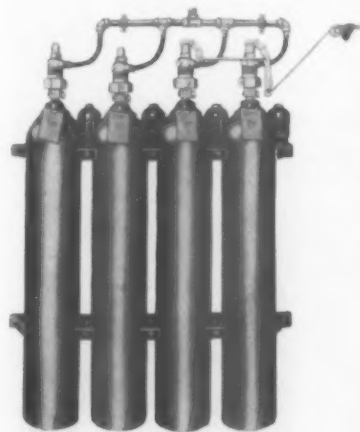
WHO IS C-O-TWO?—"C-O-TWO" is the registered trade mark and corporate name of this company. Specializing for many years in the development of carbon dioxide fire extinguishing equipment, this company has committed itself to a policy of maintaining a position of superiority in quality, workmanship, design and operation which merits careful consideration in the selection of your fire extinguishing equipment.

The high standard of C-O-TWO equipment is further assured by the rigid tests and unqualified approval of the Underwriters' Laboratories, Factory Mutual Laboratories and all Federal Bureau.

To be safe, specify "C-O-TWO" and this company's name when ordering



WHEELED TYPE  
50 to 100 lbs.  
(Net Gas Contents)



MANUAL AND AUTOMATIC  
SYSTEMS



### C-O-TWO PORTABLE EXTINGUISHER

The new and improved C-O-TWO "Squeeze-Grip" type of valve for hand portable extinguishers is another of C-O-TWO's contributions to fire protection.

The C-O-TWO "Squeeze-Grip" valve has a "pressure-closing seat," which is closed against leakage by the tremendous pressure of carbon dioxide within its own cylinder.

Opening and closing of a "hand-wheel" type portable is a slow operation when compared to a "Squeeze-Grip" type. First the portable is set down and the hand-wheel is turned to the open position which discharges carbon dioxide before the portable is picked up. It is also necessary to set the portable down to close the valve.

There is no need to set a "Squeeze-Grip" portable down as the valve is easily opened or closed while carrying the extinguisher. The valve is opened just as fast as you can close your hand as there is nothing to do but squeeze the release lever over the carrying handle.

The "Squeeze-Grip" type extinguisher is more efficient than a hand-wheel type as there is no "loss of gas" or "time" while maneuvering around a fire.

Wheeled portables are furnished with seat and disc type valves.

All C-O-TWO valves are fitted with recoil preventors and have a separate side safety or pressure relief disc.



PORTABLE  
SQUEEZ-GRIP  
4 to 15 lbs.

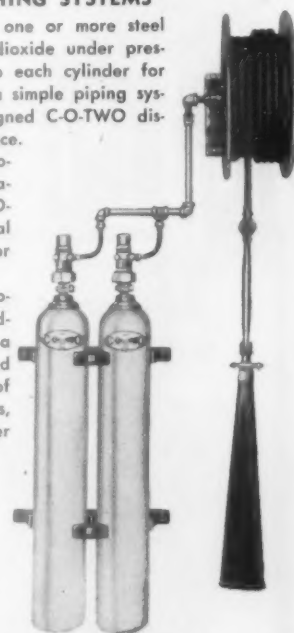
So simple a woman can operate it. It is as easily operated as closing your fingers

### C-O-TWO FIRE EXTINGUISHING SYSTEMS

The C-O-TWO system consists of one or more steel cylinders filled with liquid carbon dioxide under pressure; a discharge head attached to each cylinder for quickly releasing the contents and a simple piping system terminating with specially designed C-O-TWO discharge nozzles in the protected space.

Several types of manual or automatic releases are available for actuation of C-O-TWO systems. All C-O-TWO systems are arranged for manual operation by local manual control or by remote manual control.

Two or more spaces can be protected with a single system by flooding all spaces simultaneously, or a number of spaces may be protected with one group of cylinders, by use of C-O-TWO direction or selector valves, for direction of gas into the proper space.



FIXED HOSE REEL TYPE

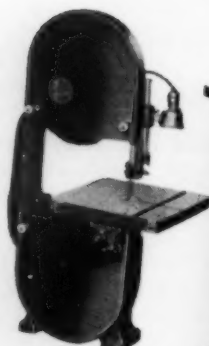
# DELTA MANUFACTURING COMPANY

671 E. Vienna Avenue

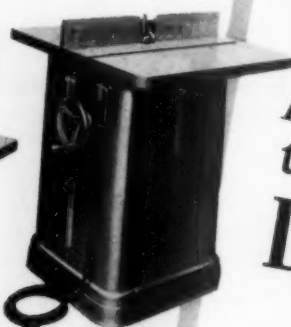
Milwaukee 1, Wis.



Delta  
17" Drill  
Press



Delta 14"  
Metal Cutting  
Band Saw



Delta Shaper



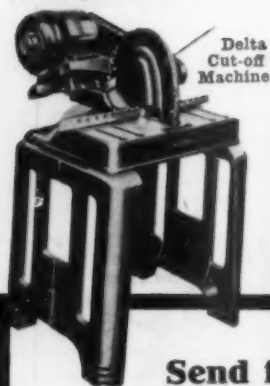
Delta Abrasive  
Finishing Machine



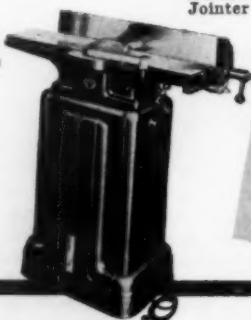
Delta Carbide  
Tool Grinder



Delta  
Grinder

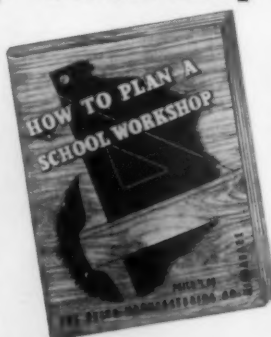


Delta  
Cut-off  
Machine



Delta 6"  
Jointer

## Send for FREE School Shop Layout Book



This FREE shop layout book contains numerous photographs and floor plans of actual school shops that have been submitted by vocational instructors from all over the country. Shows ingenious solutions of the problems of lighting, space, safety, and efficiency.

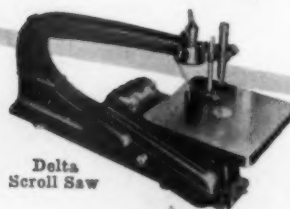
*War industry again has proved the Quality..Safety..Dependability of Delta Power Tools ... long recognized in school shops*

Delta tools by thousands have gone into war plants and directly into government service, where they have made a permanent place for themselves in the most advanced production practice — in metal-working, wood-working, and the newer fields such as plastics.

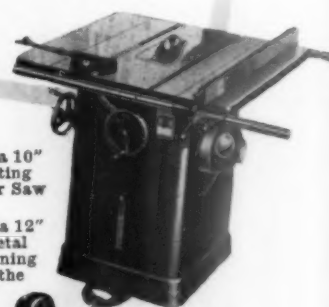
*Vocational training for industry — in war or peace — therefore is directly "on the beam" when it is conducted with Delta Power Tools.*

To their long established position as leaders in the school shops of the nation, Delta tools now add this broader and more intimate relationship to the manpower requirements of industry — making them even more indispensable than before.

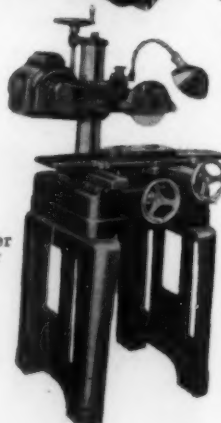
Prepare with adequate Delta equipment, for creditable performance under these added responsibilities. Write for new catalog of low-cost Delta tools.



Delta  
Scroll Saw



Delta 10"  
Tilting  
Arbor Saw



Delta  
Toolmaker  
Grinder



Delta 12"  
Metal  
Turning  
Lathe



# WANTED

Thousands of Trained Young Men and Women for the Printing Industry!

## Here is Opportunity

### TEACH PRINTING



IT DEVELOPS COOPERATION

Your students are asking now about work opportunities in the "world of tomorrow."

The Printing Industry—one of America's leading industries—needs trained young men and women now. When peace comes, other thousands will need vocational training and rehabilitation to equip them for real opportunities in a major American industry.

Tell your students about the Printing Industry . . . let them know that it is one of the three largest

industries in America . . . point out to them its stability . . . stress the advantages it offers

for continuing the educational process all through life . . . point out that printing is basic in our modern industrial society.

Authentic information about the Printing Industry is available in "Facts About The Printing Industry for Schools" . . . sent to you free and without obligation upon request. Use the *Business Reply Card* on second page following.

**A Printing Department in your school will contribute richly to the end of all Education . . . for printing is rich in artistic, informational, literary, mechanical and social values.**



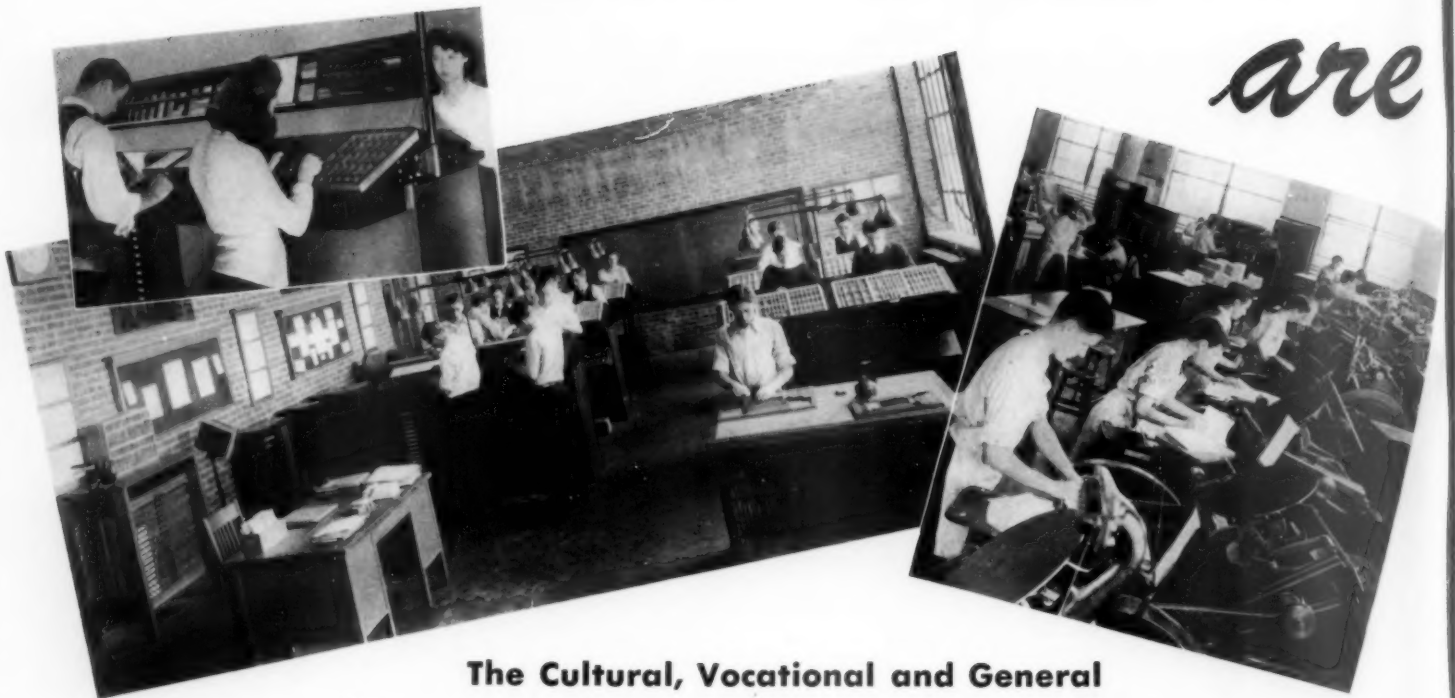
### AMERICAN TYPE FOUNDERS

Department of Education

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# Printing...Education..

*are*



Here the youth of today . . . the citizens of tomorrow . . . prepare themselves for respected, lucrative careers in a great American industry.

## The Cultural, Vocational and General Educational Values of a School Printing Department . . .

**A school printing department motivates and coordinates all academic work** by making practical application of mathematics, geography, English, art and history. Clear and orderly thinking is promoted in the process of printing composition—handling type. A better human understanding and appreciation for normal human relations is also engendered by the act of producing the printed word.

**The teaching of printing employs the modern method of "learning by doing."** Actually, through learning by printing, the student not only learns by doing but also learns from the experience of others through the medium of the printed page. Thus, both methods of learning are employed.

**A school printing department provides for many individual differences** through such widely varied and wholesome activities as art training . . . word composition and sentence structure . . . spelling . . . manual dexterity.

**The school printing department serves as a means of socializing the lives and interests** of all students by acting as a clearing-house for individual ideas and accomplishments.

**The teaching of printing develops leadership abilities, and many other desirable character-building qualities** such as neatness and cooperation. In fact, it contributes to the development of the complete personality.

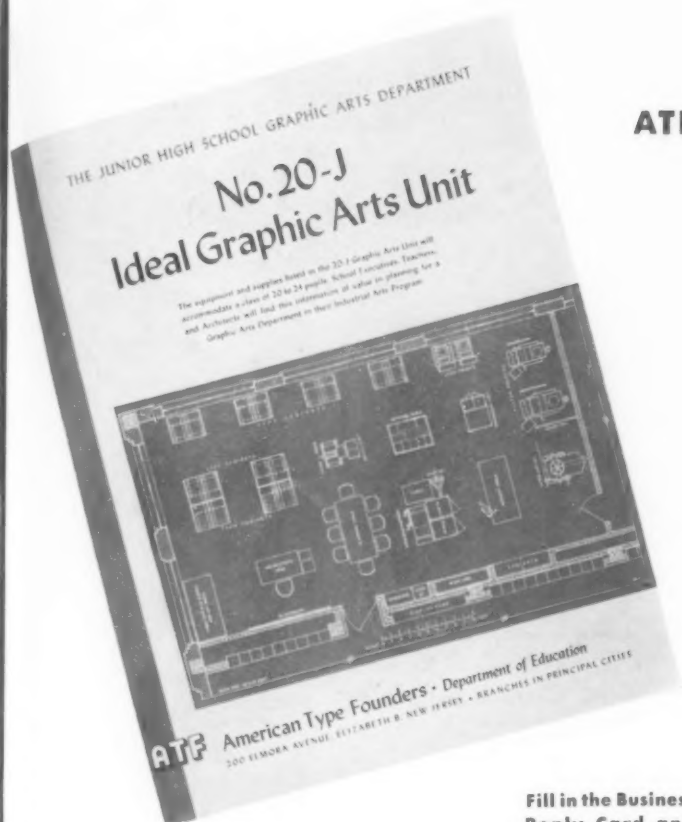
**The teaching of printing creates a feeling for beauty** through coordination of mental and physical processes in the creation of lines, curves and color. It develops a sense of proportion, good taste and an appreciation for all the arts.

**The teaching of printing provides training in an important vocation—printing.** We are all consumers of printing.

**A school printing department is a publicity medium** under school control, enabling its educational leaders to explain their educational and social program to their community. Printing can exert a powerful influence on the community.



# Industry inseparable



A series of folders like the one above has been prepared as a guide for school executives in the planning of the printing and graphic arts department. In these folders, consideration is given to

- 1—Type and size of school
- 2—Educational objectives
- 3—Number of students to be accommodated in the printing class

Use the Business Reply Card to obtain specific information as to size of printing department you need. No obligation, of course.

## ATF Education and Engineering

### Service for Schools...


American Type Founders Education Department will gladly assist you in the organization and layout of your school printing, or graphic arts department. There is no charge for this service, or obligation incurred on your part.

We will furnish you with layouts and advice on all the equipment you will need . . . for any size general, junior high, senior high, vocational or college printing plant. This service is provided by skilled engineers with long experience in the layout and operation of commercial printing establishments.

The recommended layout in each case shows where each piece of equipment should be placed; and provides for such problems as lighting, routing of material and safety of the students. These layouts are an invaluable aid to the school architect where new construction is in process.

Also included are complete lists and specifications for equipment and materials needed to stock each size of plant, as illustrated on the next page.

Inquiry is invited as to any size of school printing department.

Fill in the Business  
Reply Card and  
tear off along  
dotted line. Mail.  
NO POSTAGE  
REQUIRED. 

Please send me more information about a printing and graphic arts department in: (check school)

- |  |                                   |
|--|-----------------------------------|
| <input type="checkbox"/> General   | Number of students in class _____ |
| <input type="checkbox"/> Junior High                                     | Number of students in class _____ |
| <input type="checkbox"/> Senior High                                     | Number of students in class _____ |
| <input type="checkbox"/> Vocational                                      | Number of students in class _____ |
| <input type="checkbox"/> "Facts About The Printing Industry for Schools" |                                   |

NAME \_\_\_\_\_ TITLE \_\_\_\_\_

SCHOOL \_\_\_\_\_

STREET ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_



# Everything

for the School Printing and  
Graphic Arts Department...

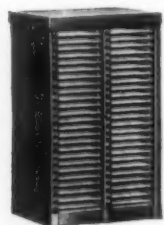
Representative Equipment Needed for the Junior High School  
Printing and Graphic Arts Department

To accommodate 20 to 24 students.

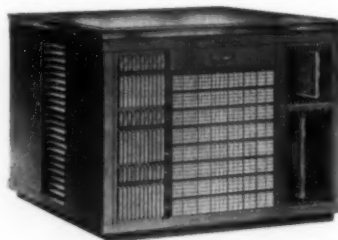
Complete specifications and layouts for other sizes of Schools  
available upon request free of charge. No obligation.



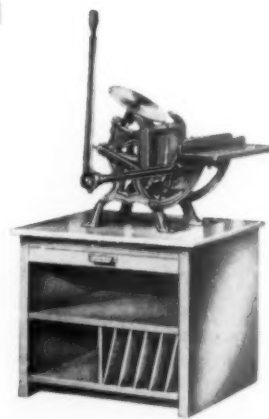
No. 19191 American Ideal  
School Type Cabinet



No. 13538 American  
School Galley Cabinet



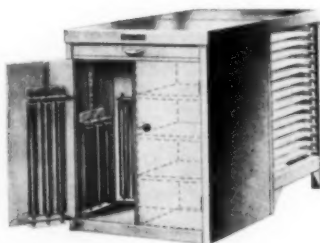
No. 13983-X American School  
Imposing Table



Pilot Lever Press and American  
School Lever Press Cabinet



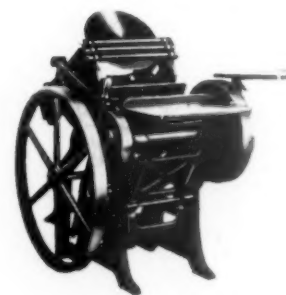
No. 1 Vandercook  
Proof Press



No. 15099 American School  
Pressroom Cabinet



8x12 New Series C & P Platen Press



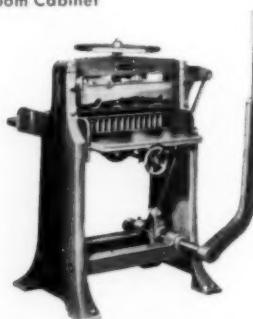
10x15 New Series C & P  
Platen Press



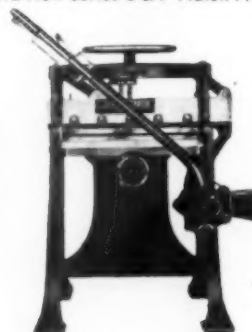
No. 15055 School Paper  
Storage Cabinet



EHFS Boston Heavy  
Duty Stapler



26 1/2 inch Hand Lever Paper Cutters



ATF-Pratt Hand Bookbinding  
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ATF Standard Silk Screen Unit

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# GENERAL ELECTRIC COMPANY

General Office, 1 River Road, Schenectady 5, N. Y.



## Plan Your Postwar School Laboratory and Shop NOW

**A**LREADY Federal, State, and local governments are laying plans to give adequate technical training to the returned soldiers, sailors, and marines who desire it.

After the war—as during the war—highly trained technical workers will be much in demand. Classes in laboratory and shop will increase in size and in numbers. New and enlarged accommodations will be required.

Competent G-E engineers stand ready to recommend laboratory equipment for the various types of courses required, and to help also in the preparation of shop and laboratory layouts, as illustrated by Fig. 1.

Today, more than ever, General Electric stands ready and willing to help you with your plans for adequate technical training of postwar students, both school-age and adult. Various ways in which this Company can be of service include:

Advisory service to educators  
Technical and descriptive publications  
Special educational services—such as motion pictures and illustrated lectures  
Proper laboratory equipment

To assist our engineers, we have retained the services of an experienced educator with a record of many years of successful teaching in vocational and technical schools; so G-E recommendations can be relied upon to conform to the best educational practice, as well as to reflect the latest and best that science has to offer in the application of electric apparatus. There is no charge for this advisory service.

It is not too early **now** to call in the services of G-E engineers to assist you in your initial plans for the postwar period.

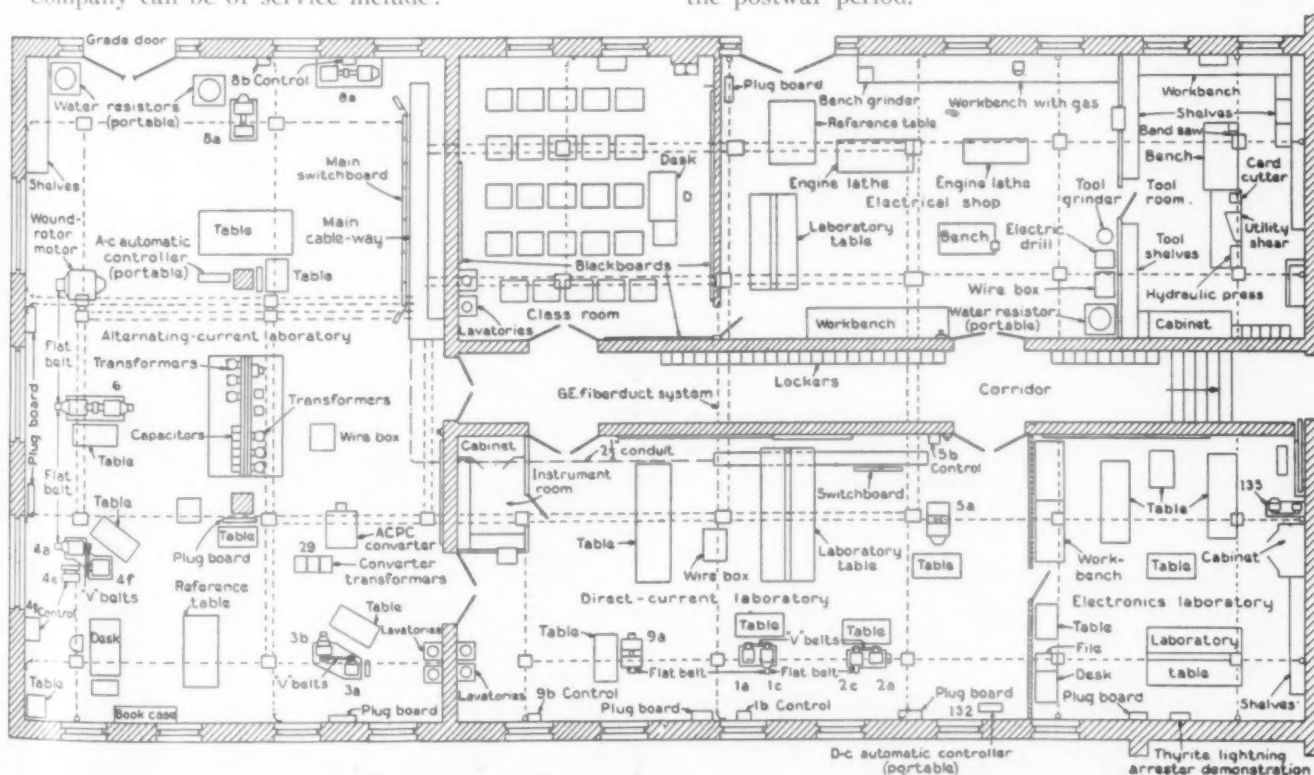


Fig. 1.

## HOW TO BEGIN

**FIRST** **Limit class groups** to not more than twenty-five students. This is about the maximum number that an instructor can handle efficiently at one time.

**SECOND** **Select standard apparatus**—the standard types of machines that the student will meet and operate when he completes his schooling. Since schools differ in the scope of electrical training offered, and in the amount of money available for apparatus, G-E Booklet GEB-62 offers three lists of recommended equipment at three different price levels, for the guidance of the purchaser. Each list includes not only the electric apparatus, but also toolroom equipment and such machine tools as are needed as auxiliaries in an electrical department. All apparatus is of standard commercial design, except in a few instances where special terminal boards have been provided, or extra leads brought out, to facilitate work in the laboratory. The machine terminal boards are now equipped with the new G-E "spring terminals," which eliminate wing nuts, washers, thumb nuts, and plug switches, thus materially simplifying connections.

**THIRD** **Be sure to have adequate equipment.** Even the best qualified teachers are greatly handicapped in obtaining satisfactory results, unless they have proper equipment and suitably planned rooms in which to carry on their work. In the last analysis, the success or failure of the program depends to a very large extent upon the facilities provided by the school authorities. Experience has shown that it is not wise to attempt to conduct a technical course with insufficient or obsolete equipment, because the resulting inadequate training handicaps the students after they enter employment.

## SPECIAL RECOMMENDATIONS

**Apparatus** The apparatus lists in Booklet GEB-62 have been compiled for schools which give broad, general laboratory courses in electrical engineering. For schools that desire to emphasize certain phases of the work, General Electric will prepare special apparatus lists to meet special requirements.

In selecting apparatus to come within a given price range, it is well to keep a fairly definite proportion between the amounts spent for the various groups of equipment, such as machines, loading and controlling devices, instruments, switchboards, etc. When this is not done, the flexibility of the laboratory and the scope of the work are greatly restricted.

**THE AMERICAN SCHOOL AND UNIVERSITY—1944**

## Switchgear for Laboratory Service

Educators of representative technical schools say that there are certain fundamental requirements for practically all switchgear installations. In view of these requirements, the G-E standard laboratory switchboard has been designed. By standardizing the design, General Electric obviously can offer schools a very efficient switchboard at a considerable saving. Each panel can be operated equally well as an individual unit or with the board as a whole. The design has been evolved to conform to the group plan adopted for purchasers' guidance. An important feature of the group plan is that each succeeding group includes all of the apparatus listed in the preceding group or groups, plus the material of the new group—thus allowing a school to build up its equipment as the course expands and as money becomes available.

The standard switchboard provides for parallel operation of both d-c and a-c generators, and for maximum flexibility of power distribution when used with the auxiliary plug panels. An installation view of the G-E educational switchboard is shown in Fig. 2. Quick-break magnetic circuit breakers are provided; hence several groups of tests or experiments can be operated at one time, each protected by the adjustable overload or short-circuit tripping value of the breaker.

The d-c and a-c generator panels are also provided with double-throw main switches so connected that odd voltages and frequencies can readily be plugged to any circuit. It is also possible to parallel the two d-c generators as shunt machines by merely using the special plugging receptacles provided.

The complete switchboard will control two d-c generators, two a-c generators, and the incoming power supply; it will also provide numerous special connections. The board is almost 21 feet long, and should be placed approximately four feet from the wall.

## Auxiliary Plug Boards

These small panels are available in six different sizes and types. The larger panels, one of which is shown at the right in Fig. 3, are designed for use in the machine laboratory where heavy currents are used. They are equipped with 100-ampere plug switches.

Smaller panels are available for single-machine stations and test tables where comparatively few circuits are required. The panels are equipped with 100-ampere plug switches and an indicating lamp.

Double and single-faced panels (not illustrated) are intended for use on tables and at test stations in electronics and physics laboratories. The panels are



equipped with 50-ampere plug switches, and colored indicating lamps to indicate the various circuits. The switches, which are smaller than those used on the larger panels, are more suitable for table work.

One panel (not shown), designed specially for physics laboratories, is equipped with 30-ampere polarity plugs and receptacles, an indicating lamp, a fuse, and a double-pole flush switch. A neon lamp is used for the indicator, so the student can readily see whether his station is plugged to a d-c or a-c circuit. The double-pole switch enables the student to control or protect his own circuit without leaving his seat.

The auxiliary panels are so designed that they can be placed at advantageous points in the laboratory to facilitate the interconnection of various machines, through the main switchboard. The panels can be either wall or floor-mounted.

#### Motor-generator-set Mountings

In general, the motor-generator sets are most satisfactory when mounted on cement blocks 22 inches high. This type of mounting is economical and insures quiet operation.

The blocks should not be fastened to the floor. In fact, it is well to use two or three layers of corrugated pressboard between the blocks and the floor. This decreases the noise and also facilitates the rearrangement of the equipment, if necessary. The blocks are heavy enough to allow the use of flat belts between the various groups of motor-generator sets: For second-story laboratories, these mounting blocks can be

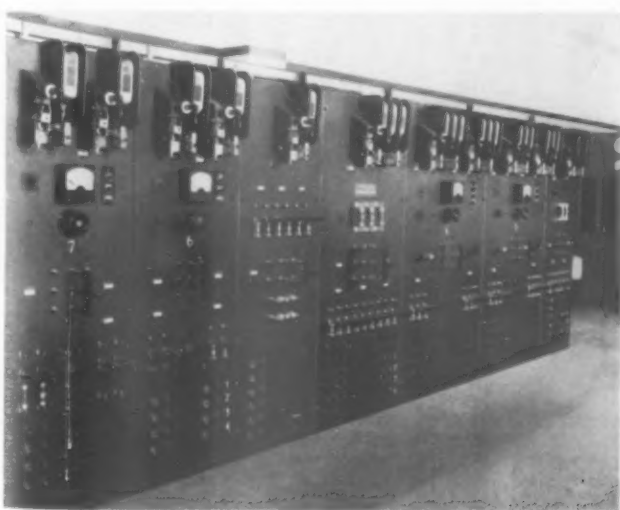


Fig. 2.

Installation view of laboratory switchboard showing arrangement of equipment.

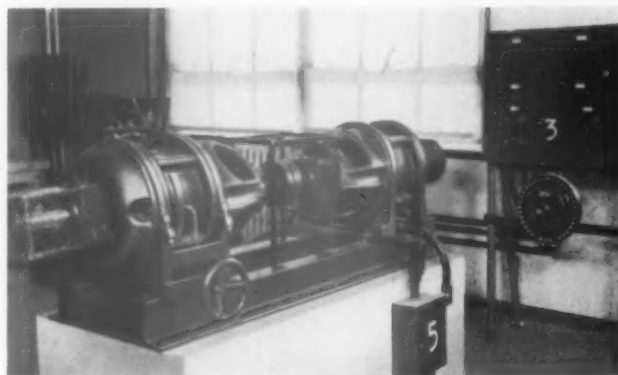


Fig. 3.

Phase-displacement set with conveniently located auxiliary panel.

constructed of heavy laminated wood. This type of mounting is desirable because of the limitations on floor loadings.

The V-belt drive is recommended as one of the most satisfactory type of drives for laboratory motor-generator sets. It is convenient, positive, and quiet. The added flexibility of this drive greatly facilitates the changing of rotors and speed ratios.

Direct drive through couplings is desirable under certain conditions. Any of the motor-generator sets can be furnished mounted on a common base with the machines and connected through a flexible coupling. It will be noted that the recommendations contain several direct-connected sets.

#### Several Price Groups

It is recognized that schools differ in the scope of electrical training offered, and in the amount of money available for apparatus. Therefore, recommended equipment has been divided into three price groups. All purchases will form a part of the permanent equipment. In case of later expansion, each succeeding group includes all of the apparatus listed in the preceding groups plus the material of the new group.

Each list includes not only the electric apparatus, but also toolroom equipment and such machine tools as are needed as auxiliaries in an electrical department.

The price of each group represents an approximate figure within which a school should be able to purchase its equipment. The price is based on special G-E rates for the electric educational equipment and on machine and hand tools of a satisfactory quality. G-E prices for school equipment afford a substantial saving over regular commercial figures, and are of

ferred to educational institutions in line with the policy of General Electric to assist the cause of education.

It is realized, of course, that these lists are largely suggestive, as they naturally will not fit all types of electrical courses; yet before making too radical a departure toward special laboratory apparatus, careful consideration should be given to the question as to whether a comprehensive course would be possible with close adherence to these lists.

#### Detailed Prices on Request

Only approximate lump-sum prices are given, but itemized prices will be gladly furnished on application to the Educational Specialist at the nearest office of the Company. With segregated prices on hand, it will be possible for the teacher to select from these groups such apparatus as will meet particular local, industrial, or financial conditions.

General Electric makes a wide variety of apparatus in types and sizes not mentioned in these pages. Where special conditions exist, and the necessary apparatus is not included in the lists, quotations will be submitted on receipt of specifications.

### GROUP "A" EQUIPMENT

Approximate price — \$8,200

This list of equipment is not offered as a standard, but as the starting minimum for schools planning technical courses. Additional equipment can be obtained to take care of the initial class as it advances.

It provides for a class of 18 to 25 students. The equipment is selected with a view of affording practical demonstrations of the fundamental theories and laws set forth in textbooks on elementary electricity and magnetism.

The apparatus is chosen primarily for classes of beginners. It will provide for a large number of elementary experiments and standard-machine tests, but it has little or no electronic-tube equipment or advanced a-c apparatus.

There are sufficient **motor-generator sets** to provide for parallel operation of d-c machines. One of these can be paralleled with the main power supply through the synchroscope on the switchboard, as is being done in Fig. 4. A 10-kw motor-generator set serves as the main source of d-c supply. The d-c generator and feeder panel, shown in Fig. 4, is designed to fit this machine. The other d-c generators can then be paralleled with it by plugging through the auxiliary panels to the main switchboard.

THE AMERICAN SCHOOL AND UNIVERSITY—1944

An alternating-current source of supply is assumed for all three lists. The **a-c motors**, which have been chosen, illustrate the latest practice in **both single-phase and polyphase design**. The controls are modern and of the safety type, which are essential in school work. The instruments are selected to fit the machines, hence all standard tests can be run.

The **direct-current machines** selected are **compound-wound**, and are designed to operate either as **generators or motors**. The effect of the various fields can be obtained by cutting them in or out under suitable operating conditions. The characteristics of these machines will differ somewhat from those of true series or shunt machines, but the difference will not be a serious disadvantage for demonstration work. Where equipment is limited, and heavier currents are desired, the paralleling of the units will supply the laboratory with direct current for demonstration purposes.

The **instruments** are of proper ranges, and are of the **portable** type, which is preferable for laboratory use. More alternating-current than direct-current instruments are included, because most a-c instruments will indicate either alternating or direct current with practically the same degree of accuracy. The equipment is thus made more flexible, without duplication of instruments for alternating and direct-current work. The use of double-scale instruments has been avoided wherever possible, as they are usually a source of trouble in the hands of inexperienced students. They do, however, add to the flexibility, and can be obtained at moderate extra cost.



Fig. 4.

Working at the big switchboard, a student brings a motor-generator into synchronism. With this specially designed equipment, it is an easy matter to teach effectively the ins and outs of switchboard operation.

The **transformers** are so designed that phase transformation from two- to three-phase, or the reverse, can be accomplished with ease. Scott taps are provided on both the high and the low sides; hence the phase change can be made with the transformers either as step-up or step-down units. Heat runs and voltage-ratio tests can be made, and it is possible to "buck" or "boost" the line voltage to provide the



Fig. 5.

The d-c section of the laboratory, equipped with convenient auxiliary boards and plug switches, makes the power supply readily accessible. Note the concrete-block mountings; they serve the double purpose of providing a firm base, and at the same time, of bringing the motor-generator sets up within easy reach of the student.

laboratory with odd voltages for special tests. The transformers can be used for efficiency and impedance tests, as autotransformers; or parallel operation can be undertaken.

The **small tools, drill press, grinder, etc.**, are considered the minimum requirement for school shops; yet there should be sufficient equipment for good work in the type of school for which they are recommended. The small tools are sufficient for a thorough course in wiring, and for building and repairing motors. In cases where local conditions necessitate, this equipment can be increased by cutting down on the number of instruments, electric machines, etc.

### GROUP "B" EQUIPMENT

Approximate price — \$17,500

The additional items of apparatus found in this group, of course, materially broaden the scope of work that can be done.

This list includes the complete **laboratory switch-board** illustrated in Fig. 2. Also a large number of additional alternating-current experiments is made possible with the Type **PM-12 oscillograph** and the **phase-displacement set** shown in Fig. 3. By using the



Fig. 6.

The drum controller provides a ready means of speed control on this belt-driven motor-generator set. Convenient terminals facilitate connections. An a-c control panel is shown in the background.

phase-displacement set as a constant-speed alternator, and the AHI machine as a synchronous condenser, valuable demonstrations can be given in power-factor correction to trade-extension and senior day-school groups.

The **phase-displacement generator** can be synchronized back on the power line, and with the aid of the **oscillograph** and **synchroscope**, one can show just what happens in the circuit when an alternator is synchronized; also, how many degrees the phase must be shifted to load the alternator fully as a parallel unit. The demonstration will show further why alternator loads cannot be shifted by field changes, as with d-c generators. The same hook-up can be used to show how a synchronous motor shifts as it takes either a mechanical or an electrical load.

The addition of **another transformer and induction regulator** makes possible another valuable group of experiments. The induction regulator provides for a wide range of odd voltages, as well as voltage regulation of a power source. The additional instruments will not only broaden the scope of the work, but also will enable more groups to work at one time without interference.

**Electron tubes** are playing a very important part in modern industrial control as well as in other applications. GROUP "B" includes enough electronic equipment to permit a comprehensive course in electronics. Many schools are devoting a whole half-year to the study of electron tubes and circuits, for senior students. General Electric has recognized the need for instruction in the industrial application of electron tubes, and has prepared a series of bulletins covering suitable experiments. The apparatus listed will cover most of these experiments. The bulletins are available for classroom distribution at a nominal charge.



### GROUP "C" EQUIPMENT

Approximate price — \$25,000

This list includes sufficient equipment for a first-class technical high school or junior college. It will provide for a high-grade four-year laboratory course, and is sufficient for at least 200 students per day. Larger numbers might require duplication of some items. The equipment in this group is especially well-adapted for the trade-extension or co-operative apprentice training classes that will rapidly multiply in numbers immediately after the close of the war, as a result of Federal plans and aid. These classes will be largely attended, in ever-increasing numbers, by soldiers and sailors as they are released from service, and are given the opportunity to train for jobs in the electrical manufacturing industries, in electrical maintenance, or in power companies.

The **phase-displacement dynamometer set**, shown in Fig. 3, in itself provides for a long list of practical a-c experiments, as well as for a modern and accurate method of measuring mechanical energy. Each machine has a shaft extension at each end and a removable center in the flexible coupling, which permits operation of units separately without any interference. The cradle-mounted unit can be used as an ordinary electric dynamometer to obtain accurate measurements of the power output of other electric motors or of small gasoline engines. This method of power measurement has become practically standard in the automotive industry, replacing the old Prony brake method.

The **ACPC synchronous converter** will permit a long list of very practical, instructive experiments, because it is so constructed that it can be operated as any one of eight different types of machines, including a standard commercial converter. It can also be used to supply either alternating or direct current to the laboratory for other experimental work, at either full or half voltage, provided that the current rating is not exceeded. It is necessary to purchase the three transformers for use with the converter, in order to provide the odd a-c voltages required by the ratio of conversion necessary to obtain 250 volts, direct current. These transformers will also prove very useful for other tests in the laboratory.

The **d-c/d-c or balancer set** is designed to fill a number of needs in the d-c laboratory, and is equipped with variable-speed starters for speeds either above or below normal. One very practical group of experiments can be performed on this set in connection with



Fig. 7.

Here an a-c generator, direct-connected to a small turbine, is tested.

the 3-wire, d-c lighting service. It can be used as a shunt or compound balancer set in connection with the rotary converter, when operated as a 250-volt generator, a 3-wire generator, or a 3-wire converter. These machines can be driven by a motor and can be used to illustrate how the 3-wire service was originally produced by connecting two generators in series. This generator set will serve especially well for a beginning class in taking characteristic curves on either shunt or compound-wound generators and motors.

The **low-voltage motor-generator set**, included in this Group "C" list, is very desirable for students who are working on series and parallel resistance measurements. It simplifies the other required equipment and provides a safer voltage for beginners. It is also desirable for high-current demonstrations, electrolytic work or storage-battery charging.

The two **induction regulators** and the **saturable reactor**, listed in Group "C," provide for a number of experiments in connection with electron tubes, in addition to the experiments in the study of regulators and reactors themselves. The regulator can be used to obtain almost any odd voltage from 0 to 440 volts for either tube filaments or plates. The saturable reactor will illustrate the thyatron system of stage-light control for theaters. This fits in well with the electronic-tube course. This type of reactor can also be used for a number of special experiments.

Group "C" listings include a large number of high-grade special and standard **portable instruments**. The double-bridge type of portable test set is valuable for senior work and for co-operative apprentice-training groups. This instrument has been developed to meet the high degree of accuracy and dependability required by industry. It is a necessity where accurate measurement of low resistance is required, as in the

series fields of d-c machines and transformer coils. The double-bridge feature makes accurate measurements possible, regardless of the lead length used in making connections.

The **selsyn motor** is rapidly becoming commonplace in many industrial applications; hence it is necessary for the modern technical or apprentice graduate to understand the installation and maintenance of this machine. Group "C" listings include enough senders, receivers, and differential selsyn motors to cover a wide range of applications. Senior students who have had instructions in selsyn control have shown a keen interest in the operation of this equipment, and frequently find new ways to use it. This work fits in very well with the electronic tube work, where selsyns are often used in connection with certain kinds of tube control.

The **loading devices**, listed in Group "C," are valuable when making a study of alternator regulation under various load conditions. With the variable reactors of one type of loading device, one can show the demagnetizing effect on alternator fields when low-power-factor loads are carried. Combinations of leading, lagging, and in-phase currents can readily be obtained with loading resistor and loading capacitors. These combinations are very desirable for power-company apprentice classes.

### These Two Booklets

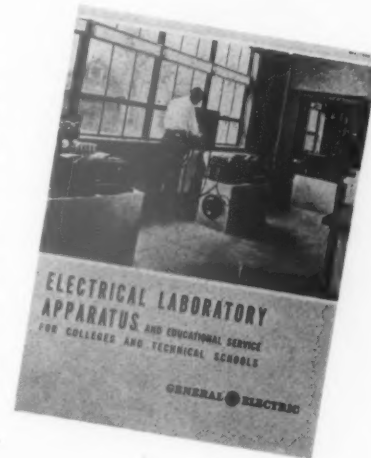
will be particularly helpful to you when planning your new laboratory or school shop, or when replanning an old one:

#### GEB-62

Gives complete lists of equipment under groups "A," "B," and "C." Also briefly describes the equipment, telling why selected and how used.

#### GEA-1185

Illustrates and describes G-E laboratory apparatus particularly adapted for use in vocational schools, high schools, and colleges. Standard commercial apparatus is usually recommended. Where the cost, size, and power requirements of such standard equipment are prohibitive, alternative apparatus specially designed for the school laboratory usually can be furnished.



THE AMERICAN SCHOOL AND UNIVERSITY—1944



It is not too early NOW to call upon **G-E Advisory Service for Educational Departments** to help you plan your postwar school shop or laboratory.



Consult nearest  
**General Electric**  
sales office

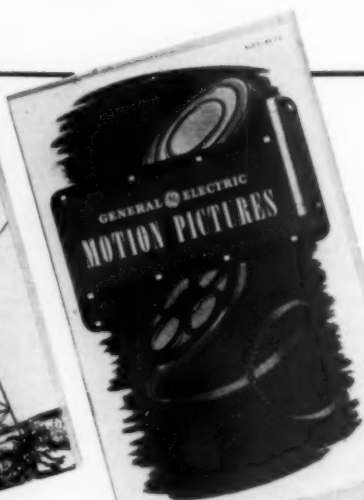
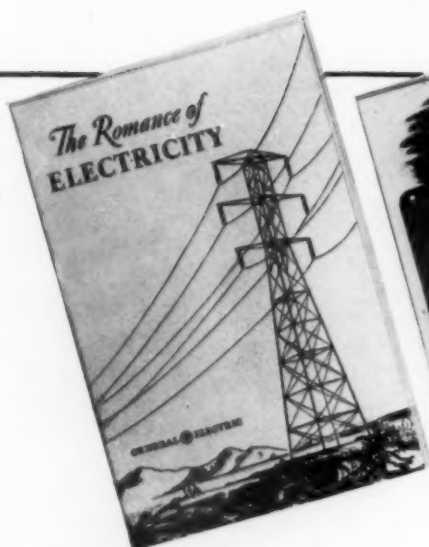


Fig. 8.

G-E panel boards and plug switches. Note the enclosed air circuit breakers shown at the top.

# PUBLICATIONS ★ MOTION PICTURES ★ PHOTO NEWS

## General Electric Educational Services



### BOOKLETS

**The Romance of Electricity**, a 56-page story which presents high lights in the historical and technical development of electricity. (GEB-131.)

**The Story of the Turbine**, a book about the amazing machine that produces America's power on land and on sea. (GEB-129.)

**The Story of G-E Research**, the history of the first industrial research laboratory and some men who have made outstanding contributions to its advance. (GEB-113.)

Ask for a complete list of publications in this series.

### MOTION PICTURES

**Exploring with X Rays**, a forty-minute sound film, a fast-moving story of X rays from their discovery to recent developments.

**Excursions in Science, No. 6**, the most recent movie in a series devoted to some notable advancements in the field of science.

**Sightseeing at Home**, an explanation of television and a visit to our studios showing the actual production of a program.

*These films are loaned to schools at no cost. Send for Catalog GES-402J which contains a complete list and description of available films.*

### POSTERS

**Photo News Service**, semi-monthly news posters giving brief accounts of recent laboratory and manufacturing developments. Information about new war equipment is included when possible. Published on the first and fifteenth of each month, these posters are now being furnished to some several thousand schools and colleges. Many science teachers use them in conjunction with their regular program. The posters are sent free, to teachers only, at their school address. An attractive wooden frame is sent with the first poster.

★ ★ ★

Address all requests to Dept. 6-318

**GENERAL ELECTRIC CO.**  
Schenectady 5, N. Y.



### ARTIFICIAL OCEAN

The ocean waves may roll, but General Electric naval equipment is thoroughly tested for durability and characteristics in storm and stress by this device. Designed by the Company for development work, this Scorsby tester simulates the roll and pitch of the ocean during the testing of naval equipment. Hats off to the man riding with the equipment — he is risking seasickness!

**GENERAL ELECTRIC**  
PHOTO NEWS SERVICE



# ATLAS PRESS COMPANY

1890 N. Pitcher St., Kalamazoo, Michigan

**Atlas**

## MACHINE TOOLS

★ FOR THE GREAT POSTWAR CHALLENGE TO VOCATIONAL EDUCATION

*M*ORE and better training — for students to fill peacetime industrial jobs . . . for rehabilitation of servicemen . . . for the millions who'll follow machine tool hobbies — that's the postwar challenge to vocational education!

Atlas Machine Tools can help you solve this problem by giving more training per student per

invested dollar. The Atlas favorites shown below provide equipment for precision training in every modern machining operation — at a cost that is only a fraction of that for unnecessarily large machines performing the same operations.

Get acquainted with Atlas tools now . . . send for catalogs and the name of our nearest distributor.

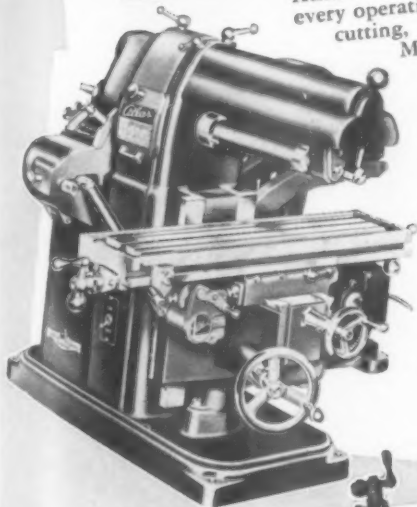
## ATLAS PRESS CO.

1890 N. PITCHER ST., KALAMAZOO 13D, MICH.



*Atlas 10" LATHE*

Atlas lathes offer training experience in every operation of the backgeared screw-cutting, automatic cross-feed lathe. Modern design for maintained precision and long life.

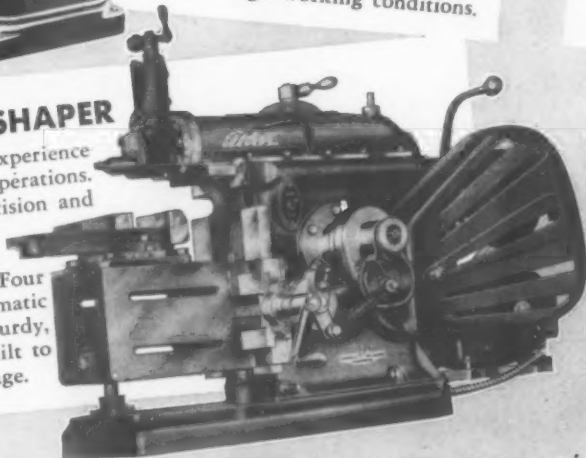


*Atlas MILLING MACHINE*

Ideal for quick training in every milling machine operation . . . from slabbing and facing cuts to end milling, keyway cutting, finishing and layout work. Precision, compact bench-type. Timken bearing equipped. Ruggedly built for long service under tough working conditions.

*Atlas 7" SHAPER*

Gives excellent experience in all shaper operations. Has all the precision and power of larger machines built down to scale. Four speeds, five automatic cross feeds. Sturdy, dependable, built to take tough usage.



*Atlas DRILL PRESS*

Training and production favorites. Long-lived, exclusive Atlas floating drive spindle for accuracy and utmost service. Bench and floor models available.

## WALL CHARTS

Large, easy-to-read charts with up-to-date technical information on a variety of shop subjects are available at low cost.

Largest chart, on the Lathe, is 31½" x 25½". Others 16" x 21". These charts are ideal both for lecture work and also for using on wall for quick reference. Complete set of five charts sent postpaid for 25 cents.

# CANEDY-OTTO MANUFACTURING CO.

*Manufacturers of Precision Equipment Since 1892*

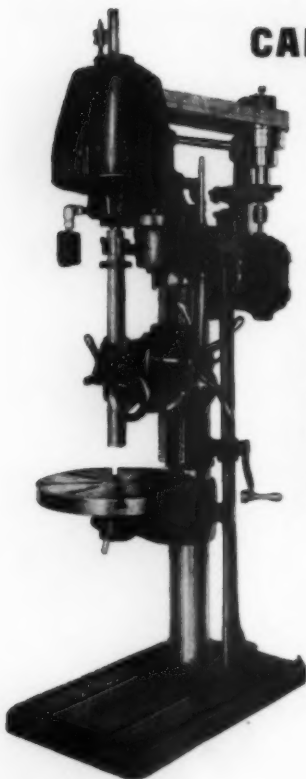
General Offices and Factory: Chicago Heights, Illinois

New York Branch: 407 Broome Street, New York City

## CANEDY-OTTO DRILLING



## PRECISION BUILT UNITS



**C.O. 21" Sliding  
Head Motor Driven  
Floor Drill**

This general-purpose floor drill is an outstanding value for the machine shop: sturdily constructed, full anti-friction bearing equipped, precision built. Spindle, table and base retain perfect alignment throughout years of use. Available with geared power feed and back gears, or with lever feed only. Drilling capacity in cast iron  $1\frac{1}{2}$ ".

**C.O. No. 16 Royal  
Bench Drill  
Motor Driven**

Meets the most exacting requirements, producing accurate work at minimum cost. Primarily designed as a metal working tool, it is also adaptable to wood-working; can be used for sanding, mortising, grinding and routing. Drills holes up to  $\frac{1}{2}$  inch, to center of  $16\frac{1}{4}$  inches. Five speeds: 5200-2835-1632-917-460 r.p.m.; with slow speed pulley, 385-732-1240-1950-3110 r.p.m. All ball-bearing equipped.



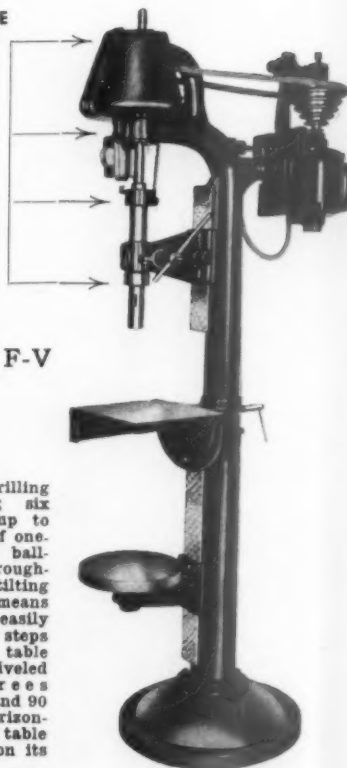
**C.O. No. 18  
Royal Floor  
Drill  
Motor Driven**

This general-purpose sensitive drill, also designed for producing accurate work at minimum cost, has drilling capacity in cast iron of  $\frac{3}{4}$  inch with  $\frac{1}{2}$ -hp. motor, 1800 r.p.m.;  $\frac{7}{8}$  inch with  $\frac{3}{4}$ -hp. motor, 1800 r.p.m.; and 1 inch with  $\frac{1}{2}$ -hp. motor, 1200 r.p.m. Six speeds. Full ball-bearing equipment.



*Write for  
illustrated  
bulletins*

**4 BALL RACE  
BEARINGS**



**C.O. No. 21"  
Stationary Head  
"V" Belt Motor Driven  
Drill**

This drill is particularly adaptable for automobile repair shops, as the height, distance from spindle to table and base, and general range, permit its use for cylinder reboring of any type or size of internal combustion motor. The brace, or supporting arm, gives additional support and strength for capacity drilling. With the back gear, 8 speeds are obtained. Drills to center of 21" circle, from 0 up to  $1\frac{1}{2}$  inches.

**C.O. 14" 3000 F-V  
6-Speed  
Sensitive  
Floor Drill**

This drill has a drilling capacity of  $\frac{3}{4}$ "; six speeds, from 345 up to 3205 r.p.m.; frame of one-piece casting, full ball-bearing equipped throughout; exclusive C-O tilting motor bracket, by means of which the belt is easily changed to various steps of the pulley; upper table capable of being swiveled through 360 degrees around the column, and 90 degrees from its horizontal position; lower table capable of rotating on its axis.

# DURO METAL PRODUCTS COMPANY

(MACHINE TOOL DIVISION)

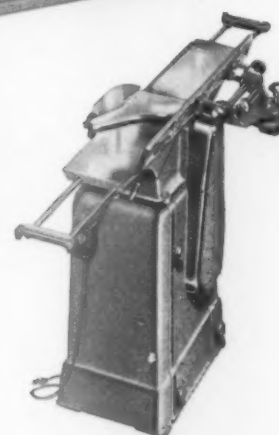
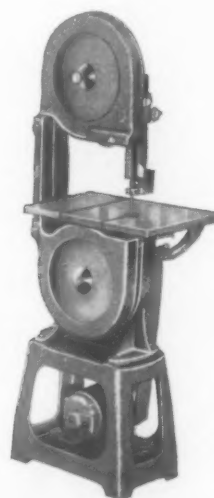
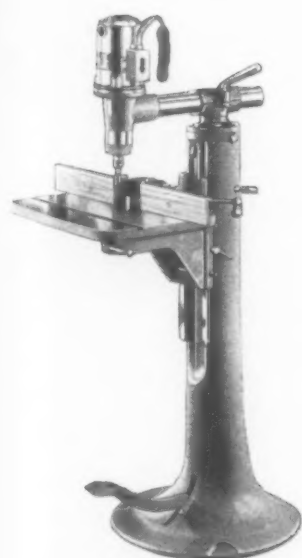
2681 N. Kildare Avenue, Chicago 39, Illinois

ALSO MAKERS OF DURO HAND TOOLS

THE complete line of DURO low-cost wood and metal working machines lends itself ideally to school shops. The machines are compact, accurate — built to stand up under hard usage — and possess many features not found in heavier, more costly machines. They are widely used for all types of production and maintenance work — as well as in shops in cities from coast to coast. The DURO line includes Drill Presses, Circular, Band and Scroll Saws, Lathes, Sanders, Hand Grinders, Jointers, Portable Electric Drills, and Router - Shaper Carver Units.

## SEND FOR NEW DURO CATALOG

Write today for latest issue of complete DURO catalog — showing illustrations, full specifications, descriptions and prices of all machines in the DURO line





# OLIVER MACHINERY COMPANY

Grand Rapids, Mich.

## BRANCH OFFICES

50 CHURCH ST., NEW YORK CITY

1450 N. MONITOR AVE., CHICAGO, ILL.

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221 SEXTON BLDG., MINNEAPOLIS, MINN.

Instructors who try to duplicate industrial working conditions in the School shop, tell us that the transition from School-room to production job, is easier for the student trained on an "Oliver." Very often the student trains on an "Oliver," and works on an "Oliver" when he gets his first real job.

All Oliver equipment is primarily designed for production work. And yet, it would be difficult to find safer, more fully guarded machines—always an important consideration for the school, where untrained boys often must learn their first rules of safety.

### METAL SPINNING IN MODERN INDUSTRY

Metal Spinning is truly an art, but finds many applications in the lighting appliance, the aviation and other industries. Because of the interesting variety of projects that are possible "Oliver" metal spinning Lathes are very popular in modern manual training shops. Write us for Text-Book on this interesting and educational work. The same lathes can be used for wood-turning also.



### CIRCULAR SAW BENCHES

There is a variety of modern Circular Saw Benches in the Oliver line from the simple and practical No. 191 Motor Driven Tilting Arbor Saw Bench for 8" diameter Saws to the larger types similar to our No. 45-D Motor on Arbor Rip Saw or the more versatile No. 232-D Tilting Arbor Saw Bench illustrated, for 12" or 13" diameter saws. Other types of saws also available, such as Universal Saw



Benches, Miter Saws, Variety Saws, Cut-off Saws and our very practical and popular No. 260-D Double arbor tilting saw bench, which offers two saws of different type, instantly available for use.

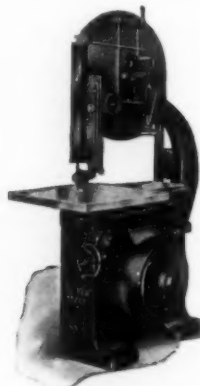
### SOUND FUNDAMENTAL TRAINING WITH OLIVER JOINTERS

Because such close, careful work is possible on all Oliver machines, the student is encouraged to form habits of accuracy and fine workmanship. The fine workmanship and precision built into the Oliver No. 144 Hand planer and jointer shown, for instance, will give the Instructor an unusual opportunity to train his class in the most modern and efficient shop practice. The Three-Knife safety Cylinder, running in ball-bearings and



**IMPORTANT:** DUE TO RESTRICTED SPACE, SPECIFICATIONS CANNOT BE SHOWN ON A LARGE NUMBER OF MACHINES. CONSULT US AS TO THE NEEDS AND REQUIREMENTS OF YOUR SHOP. OUR LONG EXPERIENCE IN PLANNING SCHOOL SHOP ROOMS ALL OVER THE NATION, MAY PROVE OF VALUE TO YOU!

"Oliver" Automatic Jointer Guard, make this machine particularly suited for the School shop. Other Oliver Jointers also available in a variety of sizes from 6 in. to 30 in. wide.



### OLIVER BAND SAWS

Full line of modern Band-Saws, from the Jr. size 18" wheel to 36" high Speed Band Saws for heavier work. We illustrate our safe, fully-guarded and very practical No. 217-D, 30 in. wheel Band Saw.

### WIDE CHOICE IN SURFACERS

The Oliver No. 299-D Single Surfer shown, is a 24" wide and up to 8" thick capacity surfer, but we offer a di-



versified choice, in a variety of models and sizes according to the requirements of the work to be done.

### OLIVER WOOD TURNING LATHES

Are manufactured in many sizes and types, from the large Pattern-maker's lathes to the junior sizes. No. 51 shown is a 12" motor head speed lathe giving all speeds from 600 to 3600 r.p.m.



### OLIVER OILSTONE TOOL GRINDER

An Important Machine in training students to properly care for all knives and edge tools. No. 585, shown at right, carries two 8" Oilstone wheels, a dry grinding wheel and an emery cone.



Junior with 6" Wheels



### OLIVER OFFERS

Circular Saw Benches

Band Saws

Band Saw Brazers (Elec-

tric)

Jig Saws

Carving Machines

Surfacing

Jointers

Wood Lathes

Metal Spinning Lathes

Sanders (Circular, Spindle

and Belt and Combination

Sanders)

Boring Machines

Mortisers

Tenoners

Shapers

Wood Trimmers

Oilstone Tool Grinders

Woodworker's Vises

Electric Glue Pots

# WALKER-TURNER CO., INC.

2244 Berckman St.



Plainfield, N. J.

## Machine Tools for Metals, Plastics and Other Materials

Drill Presses · Radial Drills · Metal-Cutting Band Saws · Metal Cut-Off Machines  
Polishing Lathes · Motor Grinders · Flexible Shaft Machines

Walker-Turner Machine Tools are practical industrial production machines, ideally suited to school and vocational training because their efficient, simplified design makes them easy to operate, therefore more quickly mastered by beginners. Each machine is compactly constructed—amply safeguarded—accurate in operation.

Because of the huge demand for metal working

tools in schools and war plants, the famous line of Walker-Turner Woodworking Machines has been discontinued for the duration. The following pages give details on Walker-Turner Machine Tools for Metals and Plastics. Our large facilities are concentrated on 24-hour production of these machines, bringing the prices within reach of school budgets and permitting prompt shipment for your war training program.

## WALKER-TURNER DRILL PRESSES

These 15" Drill Presses are available in several bench and floor models, all incorporating the efficiently designed Drill Head features shown at the right, which provide highly accurate spindle operation. Made of finest materials, built to precision standards, Walker-Turner Drill Presses are easily operated, stand up under continuous use.



**SPECIFICATIONS:** Standard spindle speeds, with 1740 r.p.m. motor, 600, 1250, 2440 and 5000 r.p.m. Calibrated depth stop, positive locking device, 4-spoke pilot wheel feed, columns precision ground. Spindle travel  $3\frac{5}{8}$ ". Chuck to table, 12"; chuck to column  $7\frac{1}{2}$ "; drills to center of 15" circle. Bench model,  $39\frac{1}{2}$ " high, 10" wide, 25" deep. Floor models, 69" high, 25" deep. Foot feed available.

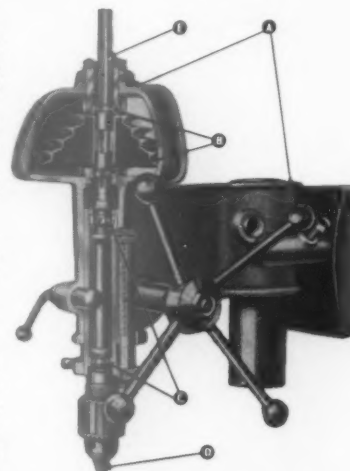
### MULTIPLE SPINDLE MODELS (Right)

Walker-Turner Drill Presses are available in 2, 4 and 6 spindle models. Shown herewith is a battery of six 20" Drill Presses in line for group operation.

THE AMERICAN SCHOOL AND UNIVERSITY—1944

### DRILL HEAD CONSTRUCTION

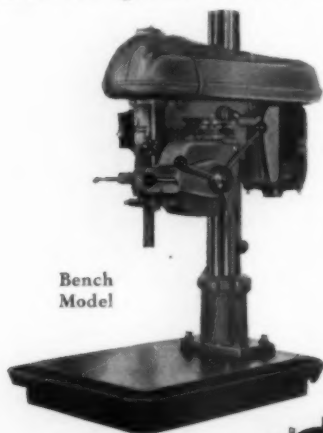
- A. One-piece head casting, precision bored to assure correct bearing alignment.
- B. Bearings above and below drive pulley take strain evenly, eliminating spindle "whip."
- C. Precision deep-groove bearings, with thrust taken by upper bearing.
- D. Jacobs chuck for maximum accuracy.
- E. A few drops of oil placed in cap will lubricate entire spindle and all four bearings. Lowest bearing sealed against dirt, dust and particles.



## 20 inch POWER FEED DRILL PRESSES

These drill presses have a compact, smooth-acting power feed unit, driven from the drill press spindle. It operates with a clutch and engages at any point, regardless of spindle position. An automatic, positive release assures holes of uniform depth. Adjustments are quickly made. Operator simply pushes the convenient lever, and drilling or tapping operation completes itself automatically.

May also be operated by the hand feed, which provides sensitive control. Especially valuable for beginners, trainees and inexperienced help. Walker-Turner 20" Power Feed Drill Presses are available in bench, floor and four spindle models.



Bench  
Model

### SPECIFICATIONS

Drills to the center of a 20" circle. Drills holes up to 1" in cast iron.  $\frac{3}{4}$ " in steel. Four feeding speeds: .003", .006", .009" and .012" per spindle revolution. Drilling speeds from 260 to 5200 r.p.m. Spindle travel, 6". Distance spindle to column, 10". Column,  $3\frac{3}{4}$ " diameter. Ten spline spindle. SKF bearing equipped.



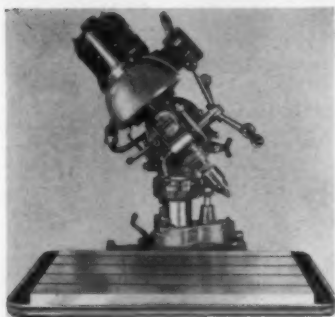
Floor  
Model



## RADIAL DRILL

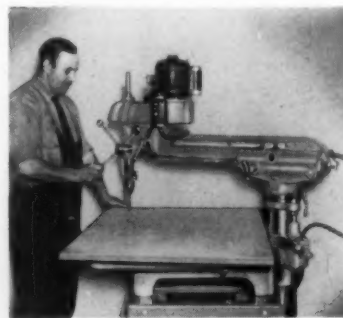
An extremely versatile, speedy, accurate Radial for drilling, tapping, routing and light profiling. Does much of the work of radials costing 5 to 6 times as much. Very easily operated, its accuracy is well within all industrial and commercial tolerances. Drill head, ram and cradle are raised and lowered by crank-operated screw mechanism at top of column. Overall height, with base,  $68\frac{1}{2}$ " maximum traverse of ram, 18". Distance nose of chuck to table,  $13\frac{1}{2}$ ". Standard spindle speeds 600, 1250, 2400 and 5000 r.p.m. with 1740 r.p.m.,  $\frac{1}{2}$

H. P. single phase motor. Higher speeds with 2-phase motor. Jacobs Chuck, 0 to  $\frac{1}{2}$ " or No. 1 Morse Taper. Machined Table surface, 28" x 19".



Left: Head tilts 45° right or left

Right: Showing wide range, which permits drilling to center of 62" circle







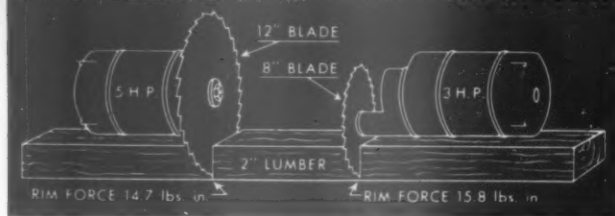
## METAL CUT-OFF MACHINE

This machine utilizes the "transverse travel" method, which permits cutting wide, flat materials, bulky pieces and many different shapes of ferrous and non-ferrous metals, ceramics and plastics. Gliding ram mounted on 8 precision ball bearings provides finger-touch control. Head operates in many positions, affording wide usefulness. Height, with steel stand, 61"; floor space 4 ft. x 5 ft.; ram travel 21½"; vertical adjustment, 8½"; working table, 17" x 45".

## PATENTED, GEARED, SHOCKPROOF MOTOR

This motor gets the shaft closer to the work, thus smaller wheels, with greater rim force, may be used.

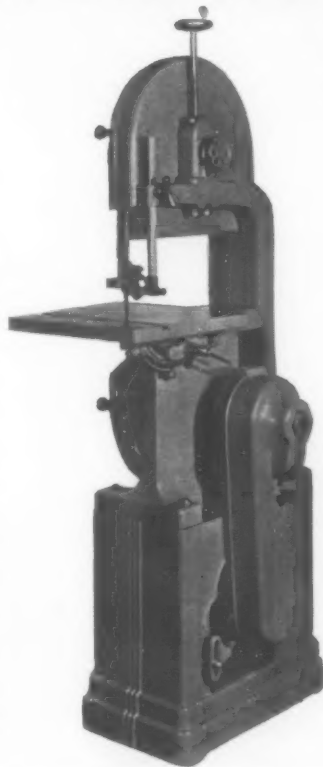
### 5 H.P. PERFORMANCE WITH 3 H.P. MOTOR



This also permits the use of smaller motors, giving 5 H. P. performance with a 3 H. P. motor. The motor has a "mechanical cushion" in the gears, to protect gear teeth against breakage under shock loads. Automatic resetting.

## METAL-CUTTING BAND SAWS

These Band Saws have back-gearing and cone pulleys, similar to those on a screw-cutting lathe, providing wide speed range for cutting or trimming die steels, ferrous and non-ferrous metals, wood, plastics, almost any material. Widely used throughout the war industries. Blade tensioning devices minimize blade breakage. Guards completely protect operator. Heavy cast-iron, one-piece frame for extra strength and rigidity. Available in 14" and 16" models.



### SPECIFICATIONS

Speed range from 50 to 2500 f.p.m. Dimensions: 16" MODEL, overall height, 71½", width, 30½", distance front to back, 22", table size, 17" x 18", blade to frame, 16", guide to table, 12". 14" MODEL, overall height, 65", width, 25¾", distance front to back, 20", table size, 16" x 16", blade to frame, 14", guide to table, 7". Tables tilt 45° one direction, 5° the other.

## POLISHING LATHES

For high-speed polishing and grinding of small parts not exceeding 3" or 4". Motors are wound for 1½ H. P. in a 3 H. P. frame, ventilated with air inlet for cool, safe operation. Available with patented, shockproof, geared motor which provides two speeds with push button control. Abrasive dusts do not enter motor or bearings. Jacobs Chuck sizes ½" and ¾"; depths, 4½" and 4" universal. Speed ranges from 950 to 7200 r.p.m. Treadle foot brake for quick stops. Available in several models.





## JOINTERS

On ordinary jointers, the guard simply swings over the knives for protection. But the guard on this 6" De Luxe Model Jointer performs a double function. It has been so designed that the work may be fed under it while the operator's left hand, resting on the guard, applies the necessary amount of pressure. Wood can be planed down to ribbon thickness, with absolute safety. And, by feeding the strip between the fence and the curved, inner edge of the guard, thin narrow strips may be planed down to practically nothing.

Texrope drive with triple V belts permits highly efficient, close-coupled motor connection. Hinged fence is equipped with quick-action release lever. Heavy, accurately machined table mounted on dovetail ways with adjustable gibs. Approved 3-knife cutterhead.

## MOTOR GRINDERS



Motors in these grinders are totally enclosed with special shaft seals to prevent abrasive dusts from damaging vital parts. Precision, dust sealed ball bearings are used. Standard models operate at 2450 r.p.m. Model GR50 ½ H.P. Grinder, shown at the left, has table and stand of cast iron. Table is 18" x 14", with cooling cup at front center. Tool tray on either side of cup. Stand adjustable 12" up or down. Wheels are 7" in diameter, 1" wide, 5/8" hole. Guards designed to latest safe-

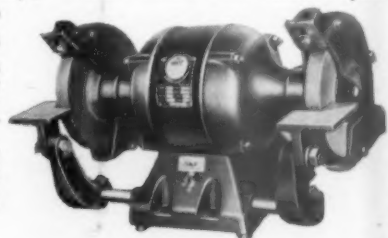
## TILTING ARBOR SAW

For greater utility and convenience this 10" Tilting Arbor Saw incorporates several exclusive features. A magnetic overload protection switch positively eliminates injury to motor due to overloading. The Vernier adjustment of the ripping fence is regular equipment. Convenient fence locking lever releases or locks the ripping fence in less than a half turn. The gun-type elevating mechanism is simple and strong and can not be jammed.

New tilting assembly, perfectly balanced and so designed that it can not be sprung or twisted out of alignment. Full 3" depth of cut, angle cuts to 45°; through 2" stock on level table. Plenty of room in front of blade. A sturdy, accurate, dependable shop tool.



ty code requirements and have large, non-shatterable glass shields. Guards removable for buffing operations. Uses wheels 6" in diameter, 3/4" wide, with 1/2" hole. Has tool rests adjustable two ways, guards with covers on outside of wheels, sturdy 10 amp. switch and 10" cord and plug.



Walker-Turner Machine Tools are stocked by distributors in all principal centers, who will be glad to give you full information on any machines or to demonstrate them in their showrooms. Write for name of nearest distributor. Complete catalog of Walker-Turner Machine Tools sent upon request.

# BROWN & SHARPE MFG. CO.

Providence, R. I.

*"World's Standard of Accuracy"*



## CONVENIENT, VERSATILE MACHINES OF PRECISION CONSTRUCTION



### MILLING MACHINES

Universal — Plain — Vertical  
including toolroom and  
manufacturing types



### GRINDING MACHINES

Universal — Plain — Surface  
—Cutter and Tool



### SCREW MACHINES

Automatic  
—Wire Feed (Semi-Automatic)

Detailed Specifications on machines of any size or type  
sent on request

THE AMERICAN SCHOOL AND UNIVERSITY—1944



# THE R. K. LeBLOND MACHINE TOOL CO.

Cincinnati 8, Ohio

Largest Manufacturer of a Complete Line of Lathes



## Super Regal

8-Speed Geared Head Lathes

Six Sizes: 13, 15, 17, 19, 21 and 24-inch Swings

### FOR LOWER INITIAL INVESTMENT

Regal Lathes are built with all the care and precision that characterize all LeBlond products. They follow the general plan of the LeBlond heavy duty lathes, and retain many important heavy duty features.

Other features are designed to perform less stringent duty; to be lighter in construction for greater ease of manipulation; and to reduce the cost of the original investment. Used for the work for which they are built, these Regal lathes assure the same long, useful service as their heavier companions. They are available with standard floor legs, or with bench legs.

### FEATURES

#### *New Rapid Speed Selector*

*Selective Geared Headstock*—8 speeds—steel gears throughout—reverse to leadscrew, feed rod and compounding gears entirely within headstock.

*One-piece Apron*—box type—rack pinion and hand-wheel on ball bearings—moving parts submerged in oil.

*Geared Feed Mechanism*—fool-proof—with both leadscrew and feed rod—automatic resetting safety device prevents undue strain on rod and feed mechanism—tumbler gears and swinging plates eliminated.

*Bed*—inverted V type—exceptionally heavy—cross girths at close intervals to resist twist and torsional strains.

### GAP BED TYPE

In many instances it is necessary to use a large lathe to swing a piece of work—while the actual machining operation can be handled by a lathe of smaller swing.

For this purpose the LeBlond Regal Lathe (except the 13 and 15 inch sizes) can be furnished with a gap bed. All the improvements and labor-saving devices are, of course, retained.

### STANDARD EQUIPMENT

Reversing type motor, vee belt motor drive complete, motor control switch. Also large and small face plates, steady rest, graduated compound rest, tool post, collar and wedge for same, taper spindle sleeve, adjustable thread cutting stop, centers and necessary wrenches, foundation plan, instruction book, lag screws and washers.

SIZE	13-in.	15-in.	17-in.	19-in.	21-in.	24-in.
Swing, in.:						
Over Way ...	13 1/4	15 1/4	17 1/4	19 1/4	22 1/4	25 1/4
Over carriage and Taper Attach. ...	8 1/4	10	10 3/4	12	13 1/2	17
Centers, *min. in.	18	18	30	30	36	36
Spindle Speeds:						
Number ....	8	8	8	8	8	8
Range, r.p.m.†	25-500	25-500	20-425	20-425	14-350	14-350
Feeds:						
Number ....	48	48	56	56	63	63
Range, in. ...	.0025 to .144	.0025 to .144	.001 to .125	.001 to .125	.0027 to .0333	.0027 to .0333
Threads, per in.	4 to 224	4 to 224	1 1/2 to 184	1 1/2 to 184	1 to 120	1 to 120
Net Weight with Motor, lbs.**	1045	1240	1985	2560	4150	4275

\* Increasing in increments of 6 inches on 13- and 15-inch and 12 inches on 17- 19, 21-24 inch sizes.

† Speeds shown can be increased 50% for tungsten carbide tools.

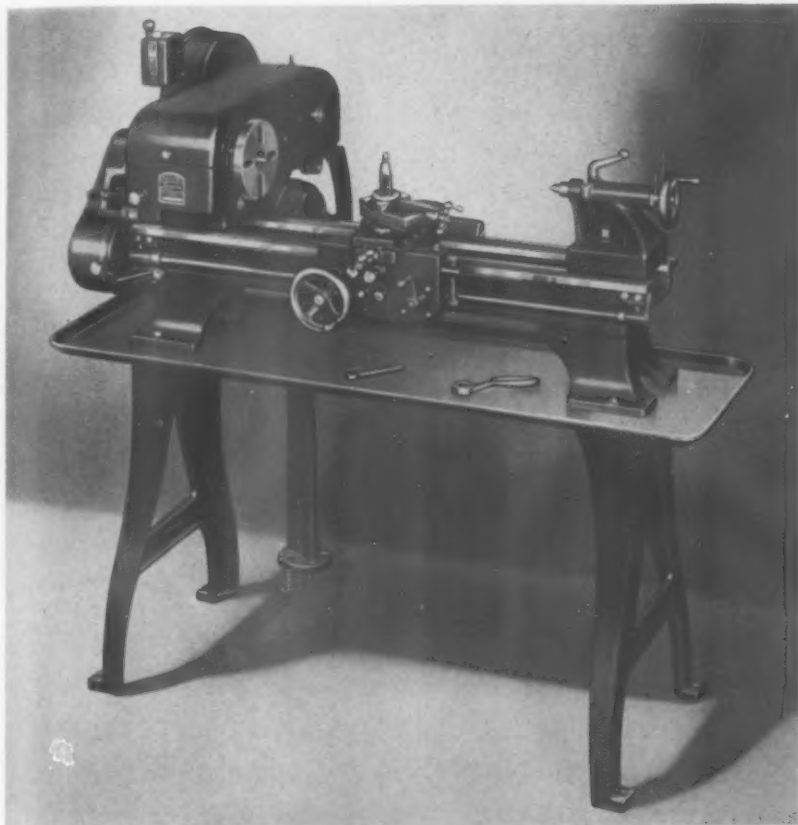
\*\* Approximate, with minimum center-to-center dimension.

THE AMERICAN SCHOOL AND UNIVERSITY—1944

# LOGAN ENGINEERING COMPANY

4901 Lawrence Avenue, Chicago 30, Ill.

*Logan* A NAME TO REMEMBER  
WHEN YOU THINK OF LATHES



Logan No. 200 Back Geared Screw Cutting Lathe  
10" Swing; 24" Between Centers

The Logan Line was developed to supply a specific need for a series of fine, high speed production lathes, engineered for sustained accuracy. Advanced design, sound engineering, expert workmanship and rigid inspection, all contribute to their excellence. A comparison of their specifications will reveal many superior features heretofore incorporated only in larger, heavier and more costly equipment. These features include: pre-loaded, precision, grease-sealed ball bearing headstock (bearings require no lubrication or adjustment for their entire life); patented countershaft assembly with three point suspension and rubber mountings to absorb vibration; precision ground ways, two prismatic V ways and two flat ways. The headstock and countershaft are of streamlined design. All pulleys and belts are completely guarded for safety of operation, yet always readily accessible by simply lifting guard.

In addition to the models illustrated, there is also available the Logan No. 830 Hand Screw Machine and the No. 850 Manufacturing Turret Lathe.

Catalog sheets for all models giving complete description and specifications will be furnished on request.

## BRIEF SPECIFICATIONS

- Swing over bed ..... 10½"
- Distance between centers ..... 24"
- Thread cutting, per inch ..... 4 to 216
- 12 Spindle speeds.... 30 to 1450 R.P.M.
- Bed Dimensions ..... 6½" x 43½"
- Precision, pre-loaded ball-bearing headstock spindle
- Spindle Hole ..... 2½"
- Precision ground ways: two prismatic V Ways; two flat ways
- Self lubricating bronze bearings at points on lathe where plain bearings are ordinarily furnished



No. 820 Quick Change Gear Lathe

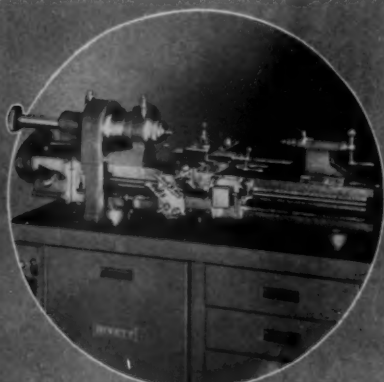


No. 825 Quick Change Gear Cabinet Lathe

THE AMERICAN SCHOOL AND UNIVERSITY—1944

## RIVETT LATHE & GRINDER, INC.

Brighton, Boston, Mass., U. S. A.



TOOL-ROOM LATHES



PLAIN BENCH LATHES



HAND SCREW MACHINES



INTERNAL GRINDERS

## A JOB WELL TAUGHT IS LONG REMEMBERED

Many a fine toolmaker and master mechanic remembers the exacting problems given by his instructor and proudly recalls how he mastered the seemingly impossible tolerances with the aid of a Rivett lathe or grinder. Likewise many a scientist and engineer justly acknowledges the part played by a Rivett machine in his research and new developments. Today these very men rely on Rivett lathes and grinders when the closest precision limits must be maintained. In turn Rivett is proud of the part it has played in training master craftsmen and developing new products.

The first Rivett machine tools were made in 1884, and through the intervening years the builders have sought to perfect their every feature in pace with the progress of the times. Designing has been guided by wide and constant study of the usage in the field, and engineering has availed itself of new production methods and materials. Quality of workmanship has been protected by a group of skilled machinists and assemblers having life-long practice in the making and assembling of Rivett machines.

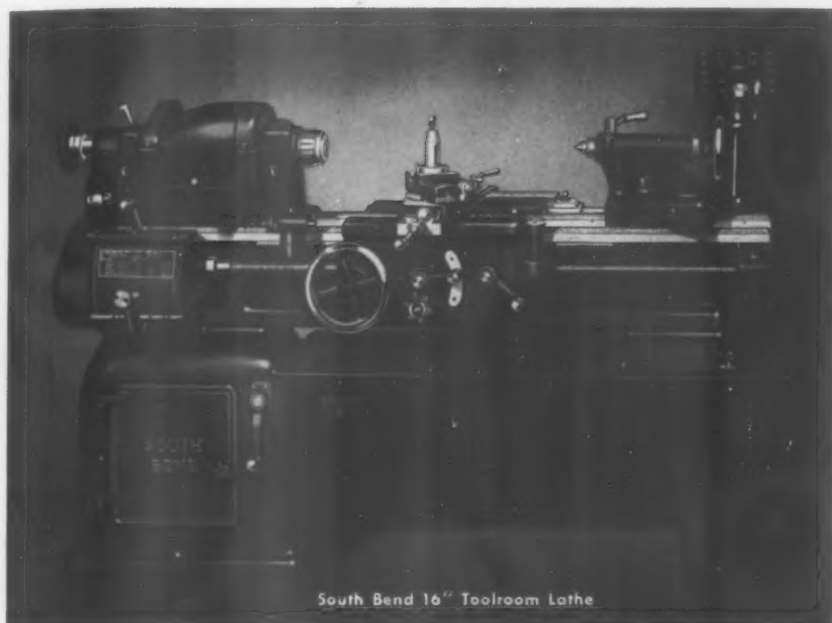
A proper and sound foundation of a machinist's training should include a knowledge of precision tolerances which can so well be taught on a Rivett machine.

*Write for General Bulletin 500*



# SOUTH BEND LATHE WORKS

SOUTH BEND 22, INDIANA

*Lathe Builders for 37 Years*

South Bend 16" Toolroom Lathe

## TYPES AND SIZES OF SOUTH BEND LATHES

### Engine Lathes and Toolroom Lathes

9" swing—  
3', 3½', 4', and 4½' bed lengths

10" swing—  
3', 3½', 4', and 4½' bed lengths

13" swing—  
4', 5', 6', and 7' bed lengths

14½" swing—  
5', 6', 7', 8', and 10' bed lengths

16" swing—  
6', 7', 8', 10', and 12' bed lengths

### Turret Lathes

Series 900—9" swing

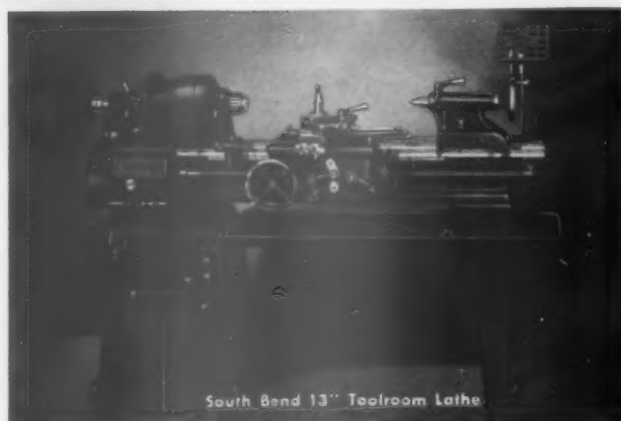
Series 1000—10" swing

The wide use of South Bend Lathes in industry, for production and toolroom work, makes them highly effective for training purposes. Because students acquire skill on the same lathes they are likely to use in their work, they become better workers in less time.

Their ease of operation, safety features, accuracy, and ruggedness have long made South Bend Lathes popular with both shop instructors and students. There is a South Bend Lathe for practically every type of training from elementary shop to advanced tool and die work. For full information, write for your copy of Catalog 100-C.

## TEACHING HELPS FOR SHOP CLASSES

To aid the training of new lathe operators, we have made available a comprehensive selection of proven teaching helps. These include books, free loan 16 mm. sound films, wall charts and booklets on lathe operation and care. Full information on obtaining this material can be had by writing for Bulletins 8-A and 21-C.



South Bend 13" Toolroom Lathe



South Bend 9" Bench Lathe

# THE BLACK & DECKER MFG. CO.

Towson, Maryland

## BRANCHES IN

Atlanta  
Baltimore  
Boston  
Buffalo  
Chicago  
Cleveland

Dallas  
Denver  
Detroit  
Indianapolis  
Kansas City  
Los Angeles



## BRANCHES IN

Memphis  
Minneapolis  
New Orleans  
Newark  
New York

Oakland  
Philadelphia  
Pittsburgh  
San Francisco  
Seattle

St. Louis

## HOLGUN ELECTRIC DRILL



An all-purpose drill—perfectly balanced, perfectly proportioned, of surprising compactness and smooth, rugged power for heavy duty production work.

Standard Equipment: 2-pole automatic-release trigger switch and locking pin, mounted as a unit with cord protector; 3-wire cable and plug (3rd wire for grounding); 3-jaw Jacobs chuck and key.

Standard Voltage: 110; also available for 220 or 250 volts. Universal Motor.

1/4" Std. Holgun	Standard Speed	Low Speed
Capacity in Steel .....	1/4"	1/4"
No-Load Speed .....	1700 R.P.M.	500 R.P.M.
Weight, Net .....	2 3/4 lbs.	3 lbs.
Overall Length .....	6 3/4"	7 1/4"
Spindle Offset .....	3/8"	3/4"
Code No. ....	345	346
Price, complete, specify voltage...	\$32.50	\$38.00

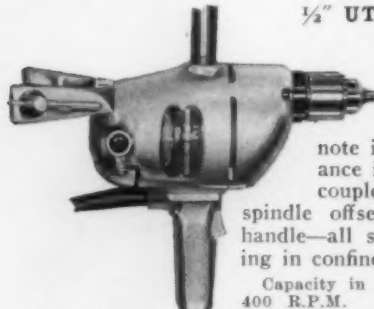
### Heavy Duty Holgun—End Handle

Capacity in Steel .....	1/4"	1/4"
No-Load Speed .....	1700 R.P.M.	500 R.P.M.
Weight, Net .....	3 3/4 lbs.	4 lbs.
Overall Length .....	7 3/4"	8 3/4"
Spindle Offset .....	3/4"	3/4"
Code No. ....	457	460
Price, complete, specify voltage...	\$36.00	\$41.50

### Heavy Duty Holgun—Side Handle

Capacity in Steel .....	1/4"	1/4"
No-Load Speed .....	1700 R.P.M.	500 R.P.M.
Weight, Net .....	4 lbs.	4 1/4 lbs.
Overall Length .....	7 3/4"	8 1/2"
Spindle Offset .....	3/4"	3/4"
Code No. ....	459	462
Price, complete, specify voltage...	\$36.00	\$41.50

## 1/2" UTILITY DRILL



This new drill is a full 3 1/2 inches shorter than the previous model, and 2 1/2 pounds lighter in weight. You'll note its perfect operating balance instantly; also the close-coupled construction, minimum spindle offset and horizontal spade handle—all so important when drilling in confined space.

Capacity in Steel, 1/2"; No-Load Speed, 400 R.P.M.

Net Weight, 10 3/4 lbs.; Overall Length, 13 3/4".

Price, complete, specify voltage—(Code No. 361) .....\$53.00

Available for 32, 110, 220 or 250 volts. Universal Motor.

## 7" SPECIAL SANDER



The popular general-purpose Sander for varied shop use.

No-Load Speed, 4200 R.P.M.; Net Weight, 12 3/4 lbs.

Overall Length, 17 1/2"; Pad Diameter, 7".

Price, complete, specify voltage—(Code No. 92) .....\$53.00

Complete line includes: Drills, Drill Stands, Hole Saws, Screwdrivers, Nut Runners, Tappers, Hammers, Saws, Glue Pot, Bench Grinders, Die Grinders, Portable Grinders, Shears, Sanders, Buffers, Vacuum Cleaners, Valve Shop, Valve Refacers, Valve Seat Grinders, Valve Lapper and Supplies.

## ELECTRIC BENCH GRINDERS

### 6" JUNIOR BENCH GRINDER

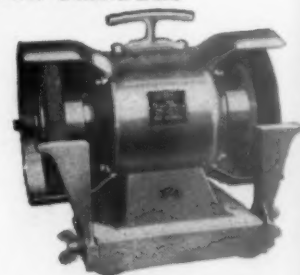
A full quality Black & Decker unit with ball bearings throughout, wheel guards, tool rests and convenient handle—unusually low in price.

Wheel Size .....6" x 3/4" x 1/2"

Motor Rating .....1/4 H.P.

Not universal

Price for all 1-phase A.C. voltages and cycles .....\$22.50



### 6" HEAVY DUTY BALL BEARING BENCH GRINDER

For heavy duty service and longer life this unit is equipped with ball bearings, also enclosed wheel guards, tool rests and handle.

Wheel size .....6" x 3/4" x 1/2"

Motor rating .....1/2 H.P.

Not universal

Price for 110 volts, 50-60 cycles, Single phase A.C. voltages only .....\$38.00

All D.C. voltages only .....42.00



## PORTABLE LECTRO-SHEAR

New, compact, perfectly balanced sheet metal shear for steel, galvanized iron, monel and stainless; copper, aluminum and lead. Easily follows straight or irregular pattern line and cuts to a minimum radius of 3/4". Blades are easy to sharpen and adjust for any thickness up to capacity.

Specifications	No. 18 Gauge Lectro-Shear	No. 16 Gauge Lectro-Shear
Capacity: in Steel (U. S. Std.) ...	18-gauge	16-gauge
Cutting Speed: No-Load .....	2500	2500
(Strokes per minute): Full-Load..	1500	1500
Weight: Net .....	5 1/4 lbs.	8 1/2 lbs.
Overall Length .....	9 1/4"	12 1/4"
Code No. (specify voltage) .....	258	259
Price, complete .....	\$60.00	\$76.00

## VACKAR ELECTRIC VACUUM CLEANER

The No. 95 Vackar is a super-powered cleaner for both automotive and industrial use. With both inlet and outlet hose connections, it can be used as a vacuum cleaner or a blower. Motor and mechanism

are completely protected from moisture and unharmed under such use. Ideal all-purpose cleaner for heavy-duty service in garages, shops, factories, etc.

Dimensions: Height .....28"  
Top Diam. ....16 1/4"  
Base Diam. ....18 1/4"  
Sealed Vacuum Pull .....65"

Weight: Net .....52 lbs.

Price, complete, specify voltage (Code No. 425) .....\$137.50

Standard voltage 110; also available for 220 or 250 volts.



COMPLETE CATALOG SENT ON REQUEST.

# STANLEY TOOLS

EDUCATIONAL DEPARTMENT  
New Britain, Conn.

## GOOD TOOLS for School Shops

Write for Catalog No. 34  
showing  
**STANLEY TOOLS**  
for your School Shops



### FOR WOODWORKING AND FARM SHOPS

The most complete line offered by one manufacturer.

### FOR ELECTRICAL SHOPS

Hammers, Bit Braces, Bit Extension, Screw Drivers, etc.

### FOR SHEET METAL SHOPS

Hammers, Chisels, Punches, etc.

### FOR AUTOMOBILE SHOPS

Body and Fender Tools, Hammers, Chisels, Punches, Screw Drivers, etc.

### FOR MACHINE SHOPS

Hammers, Rules, Chisels, Punches, Levels, etc.

### FOR FORGE SHOPS

Anvil Tools, Tongs, Hammers, etc.

*Visual Teaching Aids and Project Plans  
available at cost.*

## STANLEY TOOLS

DIVISION OF THE STANLEY WORKS  
Educational Dept., New Britain, Conn.



TRADE MARK



# MILLERS FALLS COMPANY

Greenfield

28 Warren St., New York City

**MILLERS FALLS  
TOOLS**
SINCE  
1868

Massachusetts

100 So. Jefferson St., Chicago, Ill.

America's tool production, spurred by war's demands, has increased to such an extent in the past year that a larger proportion of the output is now available for essential civilian uses.

Choose Millers Falls Tools for school use, and train students in the use of tools which most of industry considers standard.

Available through school shop suppliers everywhere. Write for catalogs.

## HAND AND BREAST DRILLS

Straight and ratchet, enclosed gear, single and two-speed—27 models. Bench drills and boring machines.



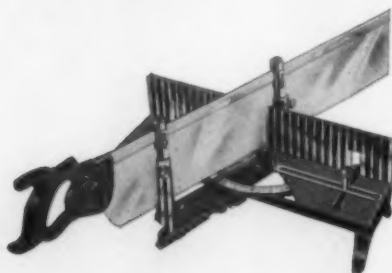
## PLANES

An unbeatable line, developed through 74 years of quality tool-building. Many kinds and sizes—smooth, jack, fore, jointer, block, rabbet, router, rabbet and fillister, scrub, and scraper.

## MITRE BOXES

Complete line of mitre boxes, metal-cutting boxes, portables, open fronts. Best known are the famous

Goodell All-Steel and Langdon Acme—high quality, great value.

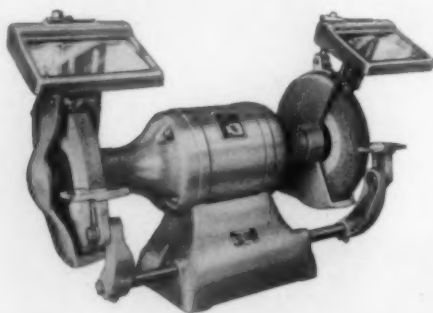


## LEVELS

For every purpose and condition of service; 18 wood models, 5 iron, others.

## BENCH GRINDERS

Complete line— $\frac{1}{3}$  h.p. to full 1 h.p. All voltages, cycles, single or three-phase. Eye-shields, lights, pedestals.



## ELECTRIC DRILLS

Complete line— $\frac{3}{16}$ " to 1". Other portable electric tools in every speed and capacity: screw drivers and nut runners; grinders; hammers; saws; disc sanders; polisher. Stands, adapters, accessories.



## HACK SAWS

Finest frames ever made, many sizes and styles. Blades for all uses: Tuf-Flex, general-purpose hand blade, super-tough, super-flexible, cuts thin-walled tubes or tough tool-steel rods without stripping or breaking. Blu-Mol Double-Life, sensational new blade with cutting edges on each side, now in widespread industrial use, should be demonstrated in every school shop.



## PRECISION TOOLS

Combination squares: precision ground, etched graduations and figures, with and without level and scriber. Also: rules; micrometers; thickness gauges; calipers and dividers; screw pitch, depth, center and surface gauges; squares; sets; and bevel protractors.



## BRACES AND AUGER BITS

Finest line of braces made: standard, ratchet, corner, whimble, angular; auger handles. All kinds and sizes of auger bits: solid center, single twist, expansive, electrician's, ship; car bits, gimlets, countersinks, etc.



# BROWN & SHARPE MFG. CO.

Providence, R. I.

*"World's Standard of Accuracy"*



## RELIABLE PRECISION TOOLS AND EQUIPMENT FOR EVERY SHOP NEED

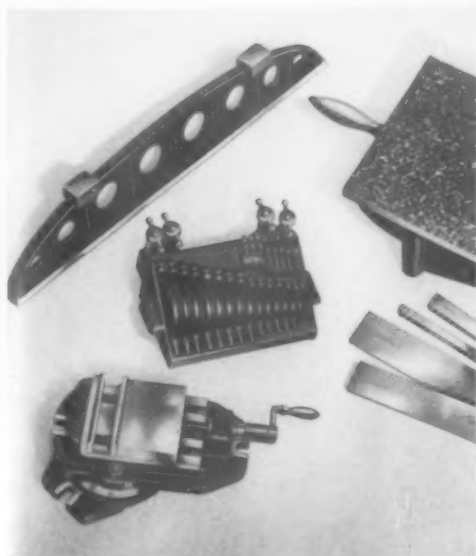


### MACHINISTS' TOOLS

Micrometers	Straight Edges
Rules	Vernier Tools
Combination Squares	Gages
and Sets	Indicators
Protractors	V Blocks
Squares	Calipers

### MILLING CUTTERS

Plain Milling Cutters	Slitting Saws
End Mills	Gear Cutters
Face Mills	Hobs



### OTHER USEFUL EQUIPMENT

Arbors and Collets	Surface Plates
Screw Machine Tools	Magnetic Chucks
Ground Flat Stock	Vises and Pumps

Catalog of  
complete line on request

# THE LUFKIN RULE COMPANY

Saginaw, Michigan, U. S. A.

NEW YORK: 106-110 Lafayette Street

## LUFKIN

### PRECISION TOOLS:

Micrometers  
Squares, Combination, etc.  
Calipers  
Dividers  
Steel Scales  
Indicators  
Protractors  
Bevels  
V Blocks  
Clamps  
Hold Downs  
Scribers  
Rules, Steel  
Punches, Center & Drive  
Pin

### Gages:

Center  
Depth  
Drill Grinding  
Feeler  
Planer  
Radius  
Screw Pitch  
Shaper  
Surface  
Telescoping  
Thickness  
Tool Sets, Students

### MEASURING TAPES:

Chrome Clad Steel  
Nubian Finish Steel  
Stainless Steel  
Engineers Steel  
Surveyors Chain  
Metallic and Other Woven  
Tapes  
Pocket, Steel & Woven

### STEEL TAPE-RULES:

Flexible—Rigid

### RULES:

"Red End" and Other  
Spring Joint  
Aluminum Folding  
Boxwood & Caliper  
Steel and Brass  
Manual Training  
Etc., Etc.



THE AMERICAN SCHOOL AND UNIVERSITY—1944



# LYON METAL PRODUCTS, INCORPORATED

General Offices: 1111 Madison Ave., Aurora, Illinois

FACTORIES: Aurora and Chicago Heights, Illinois

ASSEMBLY PLANT: Los Angeles, California

SALES OFFICES IN ALL PRINCIPAL CITIES — Consult Your Classified Telephone Directory

## Engineered In Wood for the Duration



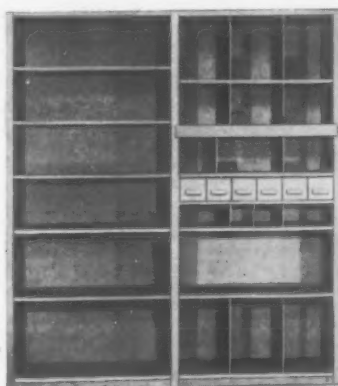
### CABINETS

In addition to the Storage type illustrated, Lyon Wood Cabinets are available in Wardrobe and Combination models. All models made in two sizes.

### SHELVING

(Patent Applied for)

Lyon Wood Shelving is completely adjustable to individual needs and may be equipped with shelf dividers, bin fronts and shelf boxes.



### LOCKERS

Single tier lockers illustrated are available in four sizes. Double tier lockers are available in one size. Send for Lyon Catalog No. 1705.



### WORK BENCHES

16 sizes and 144 assemblies. May be equipped with single drawer or two or three drawer units. Accessories include half and full depth shelves, back and end stops, shelf riser and foot rest.



### WELDING BENCHES

Lyon Welding Benches may be equipped with fire brick top as illustrated or with steel working surface and protective shield for arc welding. Shelf for welding rods and blocks.



### SHEET METAL BENCH

Lyon Sheet Metal Work Benches are equipped with heavy wood tops to withstand rough use and abuse. Three full depth shelves for storage of sheets.



### USE THIS BOOK IN YOUR POST WAR PLANNING

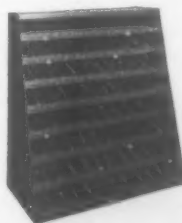
Any vocational school plans being made now can readily be built around the steel equipment shown in this 40-page, fully illustrated catalog. Get your copy now for complete information on the following Lyon made steel products—

Drawing Tables  
Work Tables  
Wood Working Benches  
Tool Cabinets  
Storage and Wardrobe Cabinets

Blueprint Cabinets  
Stools  
Shop Desks  
Shelving  
Lockers  
Folding Chairs  
Toolroom Equipment

### TOOL STANDS

Two sizes and 24 models with or without casters, center shelf, single drawer or two or three drawer units.



### TOOL STORAGE EQUIPMENT

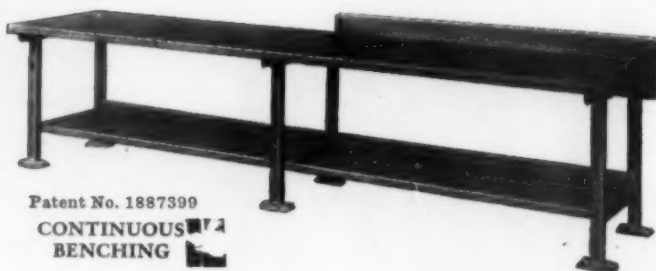
A full line of specially designed cases for accessible and orderly storage and issue of tools. Adapted for use with commercial "check" system of control.

# THE NEW BRITAIN MACHINE CO.

"New Britain" Shop Equipment      New Britain, Conn.      "New Britain" Hand Tools



STEEL TOP  
WORK BENCH  
No. 1901



Patent No. 1887399  
CONTINUOUS  
BENCHING



MAPLE TOP WORK  
BENCH No. 1910

● To conserve steel for the implements of war, we have suspended production in our School Shop Equipment Line for the duration. When Victory is achieved and New Britain turns again to peace time markets, new building programs will be under way and we will be ready to serve you once again. Many such projects are being planned now, however, and you can call upon us for assistance with your planning today . . . let us help you plan your future needs.

Send for Catalog No. 743

## A Complete Line of FINE HAND TOOLS

● More than half a century of precision manufacturing backs this famous Line. Over 1200 standard items including hundreds of specialized Hand Tools the School Shop finds practical and which encourage good workmanship. Ask for the new full line Catalog No. 56M which illustrates and describes these fine Tools in its 15 fully illustrated sections.



# New Britain



THE ARMY-NAVY "E" PENNANT flies over the New Britain plant today, signifying outstanding performance in the production of machine tools, aircraft engine parts and projectiles.

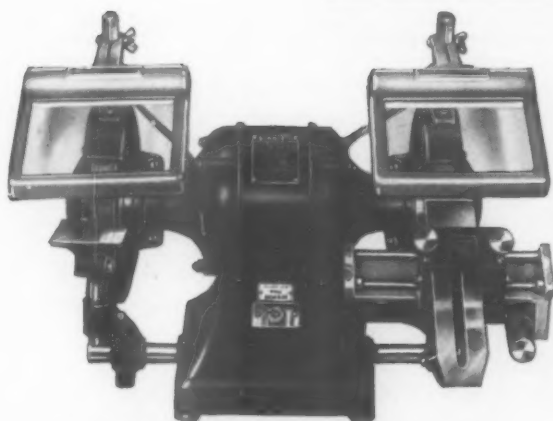
SHOP EQUIPMENT AND HAND TOOLS

THE AMERICAN SCHOOL AND UNIVERSITY—1944

# STANLEY ELECTRIC TOOL DIVISION

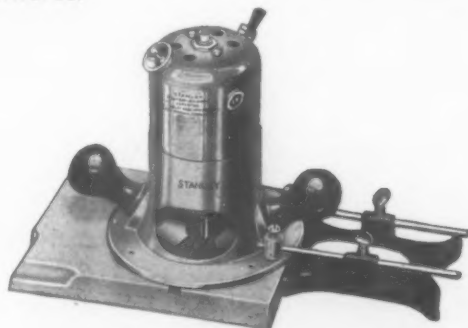
## THE STANLEY WORKS

New Britain, Connecticut



### No. 677 EDGE TOOL GRINDER

Every wood-working shop needs this improved, full ball bearing Bench Grinder. Powered by a  $\frac{1}{2}$  H.P. induction motor, fully enclosed, it operates at the correct speed for edge tool grinding. Equipped with "Fluid-Lite" Eye Shields, one Adjustable Tool Rest, and the Plane Iron and Chisel Grinding Fixtures.



### HAND ROUTER No. 10

Fast—18,000 R.P.M.—assuring a smooth finish that makes sanding practically unnecessary. For Shaping, Inlay Work, Routing, Templet Work, Veining, Grooving, Rabbeting, Corner Beading, etc. The power unit may also be quickly attached to a Beading and Fluting unit or to a shaper table. Provides a great variety of practical cuts and a wide range of decorative operations at a very low cost.



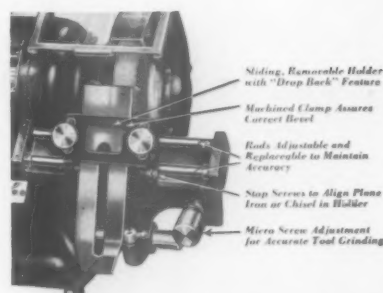
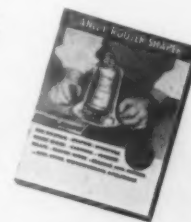
### BE SURE YOU HAVE THESE STANLEY CATALOGS

#### No. 67 STANLEY ELECTRIC TOOL CATALOG

Describes and illustrates the complete line of Stanley Electric Drills, Saws, Unishears, Grinders and other tools. Write for a copy.

#### No. 606 ROUTER-SHAPER CATALOG

Describes Stanley Router-Shapers, and all the various attachments and applications. Keep a copy on hand for reference.



### PLANE IRON AND CHISEL GRINDING FIXTURE

Standard equipment with the No. 677 Grinder, keeps edge tools accurately beveled. Takes plane irons up to  $2\frac{3}{8}$ " wide and chisels of any size. Micro screw feed adjustment.



### STANLEY "FLUID-LITE" EYE SHIELD

Effective eye-protection combined with better vision. Two light bulbs with reflectors floodlight work area, help prevent injuries. Adjustable up and down, and tilts to suit operator's position. Cannot be moved to non-guarding position without dismantling. Standard equipment on No. 677 Grinder. Can be attached to all similar bench or belt-driven grinders.



# OZALID PRODUCTS DIVISION

GENERAL ANILINE AND FILM CORPORATION

Johnson City, N. Y.

## "SIMPLIFIED PRINTMAKING"—explained



"OZALID MODEL F"

### ONLY OZALID GIVES YOU THIS VERSATILITY

Ozalid Dry Development is the big difference when you compare processes. Because of it, you can use a complete line of sensitized papers, cloth and foils—an impossibility with wet or "semi-dry" processes.

With these Ozalid materials—you can make prints having black, blue or maroon lines on a white background.

You can produce transparent prints . . . which may be substituted for valuable originals in subsequent print production . . . or be employed by draftsmen to eliminate unnecessary tracing when making design changes.

And you can reclaim soiled or worn originals by making foil duplicates.

THE AMERICAN SCHOOL AND UNIVERSITY—1944

You . . . or anyone in the office can turn out whiteprints of your engineering drawings, charts or letters.

It's easy . . . because Ozalid is different. There are no water baths, potash baths, driers or controls to demand the services of experts. You feed your original and a piece of Ozalid sensitized material into the machine. Two fast steps—Exposure and Dry Development . . . and your print is delivered, ready for immediate use.

What's more, all Ozalid materials are available in cut sheets as well as roll stock . . . thus you can eliminate trimming waste by ordering materials the size of your originals.

### HOW TO SAVE TIME, LABOR AND MATERIALS

If you have already installed expensive blue-printing equipment, you can add an Ozalid Dry Developing unit which, when used with your present printer, will give you all of Ozalid's advantages.

If you're being slowed down by inadequate equipment, order an Ozalid Whiteprint Machine. There's one for every production requirement. You can rely on it for all your printmaking.

*Write for catalog and samples  
of Ozalid Whiteprints today*

# THE C. F. PEASE COMPANY

Leading Blueprinting Machine Manufacturers Since 1907

2633 West Irving Park Road, Chicago, Illinois

EASTERN SALES OFFICE—254 Fourth Avenue, New York City

DISTRICT REPRESENTATIVES — Boston : Newark : Philadelphia : Washington : Pittsburgh : Cleveland  
Dayton : Detroit : Milwaukee : Birmingham : St. Louis : Dallas : Los Angeles

**PEASE BLUEPRINTING MACHINES** have maintained leadership in the blueprint industry because of the Pease policy of resourceful engineering, painstaking research and vision. One purpose has been uppermost—to make the finest machine possible for producing better blueprints faster and at lower cost. Pease originated the time and money saving process of blueprinting, washing, developing and drying by one continuous operation—that is why the majority of commercial blueprinters, government departments and industrial firms use Pease machines.

## BETTER BLUEPRINTS, FASTER AND AT LOW COST



Pease "22-16"

Pease "22-16" Equipment —Speed 20 Feet per Minute — Pease "22-16" is the fastest selling member of the Pease streamlined family of continuous blue-printing equipment. It consists of a Pease "22" Printer operating in conjunction with a Pease "16" Processor. Among its many exclusive features are Sliding "Vacuum-like" Contact which smooths out tracing inequalities; **Three-Speed Lamp Control** which allows

lamps to be operated at 10, 15 or 20 amperes as desired, and which avoids frequent dryer changes; **Actinic "No-Break" Arc Lamps** which give unequalled uniformity of light emission, burn for 45 minutes without breaking the arc and then resume instantaneously; **Horizontal Water Wash** which floats exposed paper free from tension, prevents wrinkles, staining and bleeding; **Quick Change Chemical Applicator System** which allows change from Blueprints to Negatives, or vice versa, in 30 seconds, and is the only economical method of applying potash to one side and hypo to both sides of paper; and **five 8" Drying Drums**, either gas or electrically heated, which allow gradual drying without distortion. Pease "22-16" is made in 42" and 54" sizes.

## OTHER PEASE BLUEPRINTING MACHINES

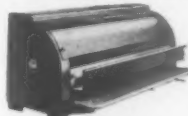
not illustrated, provide a wide range of production. Pease "22" fastest and finest of them all, has **three-speed lamp control**, many exclusive features, a production speed in excess of 30 feet per minute, and is made in 42" and 54" sizes. Pease "11," Complete Equipment with oven type dryer, and a production speed of 12 feet per minute, completes the line. It is made in 42" and 54" sizes. **Note: All Pease arc lamp blueprinting machines are suitable for making blueprints, negatives, or direct process prints.**



Pease "77"

Pease "77" . . . Speed 20 Feet per Minute . . . the latest addition to the Pease line of continuous printers for making blue prints and direct process prints. Among its many features are Sliding "Vacuum-like" Contact, which prevents wrinkling of prints and errors. . . . High Pressure Quartz Tube Lighting element with light emission speed control . . . Time Clock, which records number of hours tube is burned . . . Streamlined Design, using minimum of floor space. Pease "66," not illustrated, possesses most of the Pease "77" features, and has a speed of 12 feet per minute. Both of these models are made in 42" size only.

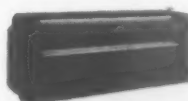
## PEASE "700" MULTAZO WHITEPRINT (DRY DIRECT PROCESS) DEVELOPING UNIT



Pease "700"

process paper. It is made in 42 inch and 54 inch sizes.

The Pease "700" is a sheet fed table model developing unit for use with any blue-printing or dry direct process printing machine. It is very easy to operate and develops prints at two speeds—4 feet or 8 feet per minute. Although Pease "700" was designed for use with Pease Multazo Whiteprint (Dry Direct Process) Paper it operates with equal facility with any other dry direct



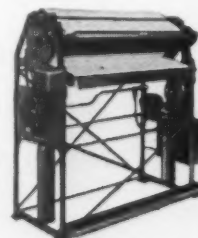
Pease "3"

Pease "3" . . . Speed 2 Feet per Minute . . . a table model continuous printer for making blueprints, negatives, or direct process prints where a comparatively small quantity is required. It has low pressure vapor tubes, and sliding contact, and is made in the 42" size only.



"Senior" Washer

Pease "Senior" and "Junior" Sheet Washers . . . for washing and drying blueprints and brownprints in cut sheet sizes, eliminate open bath trays, dripping prints, and wet floors. These washers are especially recommended for use with Model "9," Model "3," Model "77" and Model "66" Continuous Printers and with the Pease "Junior" Vertical Printer. "Senior," made in two sizes, washes prints up to 42" x 72" and 54" x 72" in size while "Junior" washes prints up to 24" x 36" in size.



"Senior" Dryer

Pease "Senior" and "Junior" Sheet Dryers . . . for drying blueprints and brownprints in cut sheet sizes, quickly and at low cost. The "Senior" has copper drums, rheostat speed control with neutral gear, automatic band control and may be heated either by gas or electricity. It has a speed of 8 feet per minute and is made in 42" and 54" sizes. The "Junior" possesses many of the "Senior" features, has a speed of 2 to 3 feet per minute and is made in 24" size only.

**EVERYTHING FOR BLUEPRINTING** . . . Pease manufactures and carries a complete line of Blueprinting equipment including other units not illustrated or described here. Among them are Dry and Wet Direct Process Developing Units . . . Blueprinting Accessories . . . Blueprint and Negative Paper and Cloth . . . Multazo Whiteprint (Dry Direct Process) Paper . . . Carbons . . . Thermex Globes . . . Open Flame and Enclosed Arc Lamps for photoengravers, photolithographers and photocopy work, printing, enlarging, and vacuum frame work . . . and the latest type Drafting Room Furniture including drafting tables, drawing boards, filing cabinets, stools, etc.



Paper—Carbons—Globes

Write for Catalog and Descriptive Literature. No obligation, of course.

★ ★ ★ *Pease Blueprinting Machines* ★ ★ ★

A TYPE AND SIZE FOR EVERY REQUIREMENT INCLUDING DIRECT PROCESS PRINTING

THE AMERICAN SCHOOL AND UNIVERSITY—1944

# WICKES BROTHERS

Manufacturers of  
Continuous Electric Blue Printing Machines

Saginaw, Mich.

Established 1854

## MAKE YOUR OWN *Blueprints*

**FOR LESS THAN 1¢ PER SQUARE FOOT**



**REMARKABLE NEW *Simplex* BLUEPRINTER CUTS COST, SAVES TIME — NO EXPENSIVE EQUIPMENT. NO EXPERIENCE NECESSARY! • ACT NOW!**

Don't give your money to outside firms for blueprints. With a Simplex Mercury Vapor-Tube Portable Blueprinter you can now make blueprints up to 42" wide (any length) in your own offices at a fraction of regular commercial prices. Model "D" (One mercury vapor lamp) has printing speed up to 24" per

minute. Model "E" (Two mercury vapor lamps) has printing speed up to 48" per minute. Can be used for any of the Special Developing Processes. Requires no carbons or globes. Beautiful black crackle "Weaver" finish. Operates silently. Your office girl can easily operate a Simplex.

**FREE TRIAL** 

**FREE TRIAL!** Don't take our word for the money-saving advantages of a Simplex! For a limited time only we will ship a regulation, complete Simplex Blueprinter on 30 days' free trial. Satisfaction guaranteed or money refunded. Write today for complete facts about this amazing, money-saving offer.



# PENN METAL CORPORATION OF PENNA.

48 Oregon Avenue, Philadelphia, Pa.

SALES OFFICES IN  
PRINCIPAL CITIES



IN BUSINESS CONTINUOUSLY  
SINCE 1869

## PRODUCTS FOR PEACE

### STEEL LOCKERS -- STORAGE and WARDROBE CABINETS STEEL SHELVING -- TOOL UNITS -- METAL SPECIALTIES

## PRODUCTS FOR WAR

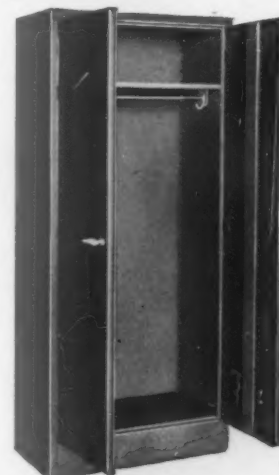
Many standard Penco products have now been adapted for the sole use of Government services, as well as various items of special equipment. While manufacture of Penco *steel* products is restricted, most of the items are available in wood for essential civilian needs. The same sound, engineered construction applies to these conservation substitutes as to our normal products developed over a period of seventy-three years. Complete information and specifications on Penco steel or wood equipment will be given on request, for either current or future use.



Single Tier  
Locker  
Type 50-U-2



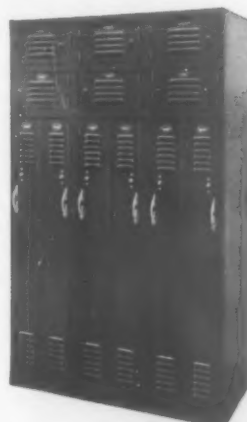
Box  
Lockers  
Type 40



Wardrobe Cabinet  
Type 3618-W



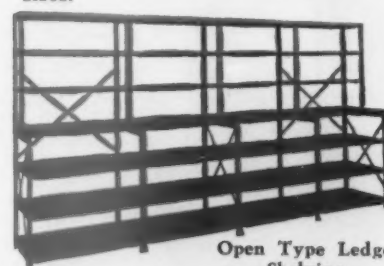
8-Compartment  
Locker  
Type 82



2-Person  
Lockers  
Type 734

## STEEL CABINETS

for wardrobe, storage or combination use are made in many styles and sizes.



Open Type Ledge  
Shelving  
Style No. 117-L, Type B

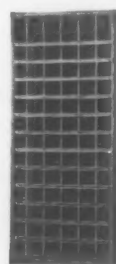
## STEEL LOCKERS

Penco single tier, double tier, box and multiple lockers of various types provide the complete storage facilities needed by all schools.



Steel Table  
No. 651

Steel Counter  
No. 652



Small Parts Unit  
No. 154

## STEEL SHELVING

Six basic types of Penco Steel Shelving are available, which with readily added accessories provide facilities to meet every storage requirement.



Closed Type  
Plain Shelving  
Style No. 118, Type A

*Special metal storage equipment made to suit individual requirements*

THE AMERICAN SCHOOL AND UNIVERSITY—1944

# NATIONAL LOCK CO.

Rockford, Illinois

BRANCH OFFICES

Chicago  
Chattanooga  
Cincinnati  
Cleveland  
Dallas  
Detroit

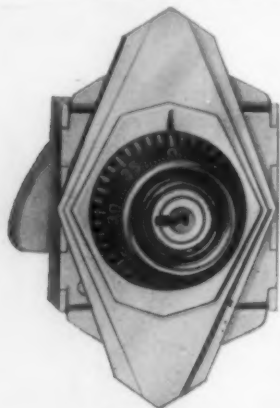
Evansville  
Grand Rapids  
High Point, N. C.  
Indianapolis  
Jamestown  
Kansas City, Mo.



Los Angeles  
Martinsville, Va.  
Milwaukee  
New York  
Portland  
Rochester

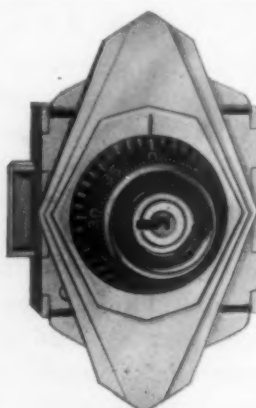
St. Louis  
St. Paul  
San Francisco  
York, Pa.  
Toronto, Ont.

**R**OCKFORD COMBINATION LOCKER LOCKS are made for standard Steel, Wood or Masonite Lockers of any style or make. It is the complete line assuring the utmost in security, convenience, simplicity and durability. Rockford Locks have proven their worth in hundreds of Educational Institutions. For simplified and complete supervision and control select the Rockford Line.



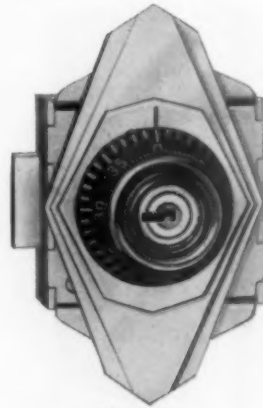
NO. 267

Master Keyed Combination Self Locking, for use on Lockers having spring latch bar. Over 64,000 different combinations available. No bolt or rivet heads visible from outside. Can also be furnished without Master Key feature.



NO. 269

For use on Box type Lockers having no latch bar. Lock has beveled spring bolt. Closing door locks lock and spins dial concealing last figure of combination. Furnished with or without Master Key feature.



NO. 271

Master Keyed Combination Dead Bolt Lock having square end dead bolt. Lock does not have self-locking feature. Combinations of this lock and Nos. 267 and 269 can easily be changed by removing escutcheon plate and turning dial.

## COMBINATION SHACKLE LOCKS

Keyless Combination Self-locking Shackle Lock that is fool proof, secure and durable. Inserting shackle upsets combination by turning dial. Must be completely re-dialed to open. Over 64,000 different combinations available. This is a very popular lock in the Rockford Line. Lock case is Chromium Plated and dial is black with white figures.

NO. 275

### COMBINATION SHACKLE LOCK

Where Locks are purchased by School authorities to be sold on a no-refund basis, this Lock is suggested. The finish is Baked Aluminum and Varnish, a very attractive item, and all mechanical parts of any importance are made of Brass. Parts requiring extra strength are made of Steel, Cadmium Plated and are completely rust-proof. The shackle is self-locking and there are over 64,000 combinations available. Dialing is ratchet or click type permitting rapid operation and the large numerals are easily read, even in dark corridors or locker rooms. This is a full-size Lock of special value and should be re-sold to the students at 10¢ to 25¢ more than the actual School cost.



NO. 265



NO. 275

Master Keyed for ease and convenience of supervision. Can be Master Keyed with all built-in Locks shown above, or Laboratory Lock shown below. Students operate lock by combinations, while officials gain access by use of Master Key. Dial is locked against rotation when shackle is open.

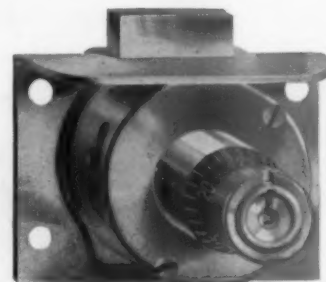
NO. 259

### COMBINATION DRAWER LOCK

Combination Master Keyed Laboratory Drawer or Door Lock. Combination can quickly be changed without removing lock from mortise. Lock is of Solid Brass construction and is not affected by ordinary Laboratory fumes and acids. Lock is reversible for use on right or left hand doors.



NO. 264



NO. 259

Illustrated here are only a few of the many School Locks available in the Rockford Line. Ask for illustrated folder showing complete line.

# THE YALE & TOWNE MFG. CO.

TRADE **YALE** MARK

Stamford, Conn.

TRADE **YALE** MARK

**INTRODUCE** true economies, maximum security and increased efficiency in locker rooms with these Yale Combination Locker Locks. They supply a degree of protection heretofore unavailable in locks of this type for locker use; security which discourages temptation, aiding in character development. Large easily read dials simplify operation, and minimize congestion and delay in locker rooms.

## FOR ALL MAKES AND ALL TYPES OF STEEL LOCKERS

FOR NEW LOCKERS AND FOR REPLACEMENT OF WORN OUT LOCKS ON OLD EQUIPMENT

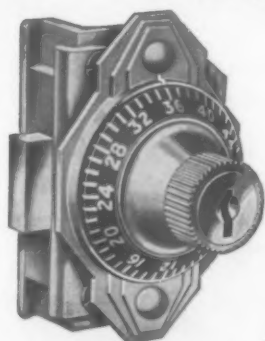
### Exclusive Yale Features:

**Maximum Security:** Combinations dialed on three positive numbers. Combination must be known and cannot be located by manipulating dial.

**Combination Disperser** automatically upsets combination as lock is locked. A double safeguard. Acts as a defense against tampering.

**Combination Changeable** with every change of locker occupant—without removing lock from door. Feature secluded in back of lock in same secure manner as in Yale Bank Locks.

**Supervisory Control** of a group of lockers or the collective groups of a city school system obtained by the Yale Emergency Key Control. The key used is assigned exclusively to these locks.



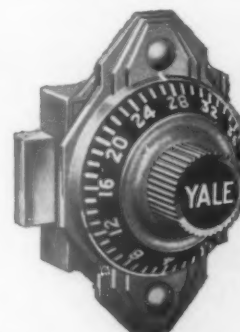
For Lockers with Automatic Bolt Release Mechanism. Automatic Self-Locking Vertical Sliding Bolt. A New Locking Principle.

Emergency Key Controlled  
No. L3374-CM, Cadmium finish  
No. L3374-DZ, Chromium finish  
Dial Operated Only  
No. L3364-CM, Cadmium finish  
No. L3364-DZ, Chromium finish



For Steel Compartment and Box Type Lockers. Beveled Spring-bolt, Automatic Self-Locking.

Dial Operated Only  
No. L3369-CM, Cadmium finish  
No. L3369-DZ, Chromium finish  
Emergency Key Controlled  
No. L3379-CM, Cadmium finish  
No. L3379-DZ, Chromium finish



For Lockers with Gravity Type Locking Device. Dead Bolt Manually Operated.

Dial Operated Only  
No. L3368-CM, Cadmium finish  
No. L3368-DZ, Chromium finish  
Emergency Key Controlled  
No. L3378-CM, Cadmium finish  
No. L3378-DZ, Chromium finish

## NEW YALE COMBINATION PADLOCKS

FOR BASKET LOCKERS AND ALL OTHER TYPES AND MAKES OF STEEL LOCKERS

The finest and most secure combination padlocks yet produced

Same features of maximum security and automatic combination disperser as the above built-in type.

**No. 579 Lock**, Dial operation only.

**No. 589 Lock**, Dial operation with emergency key, provides supervisory control of lockers. May also be used with any of above built-in types under same control key.

These padlocks have  $\frac{1}{4}$ " diameter steel shackles and the graduations and numerals on the black enameled dial are easily read.

**No. 515 Lock**, Dial operation only. A good secure medium priced padlock. The steel shackle is  $\frac{3}{8}$ " in diameter and the case of solid rustless metal is attractively finished in bright baked aluminum.

The Yale Rotating Dial provides fast accurate dialing.

The Combinations are unlimited on all above padlocks.



No. 589  
Master-Key Controlled Dial



No. 515  
Dial Operated Only





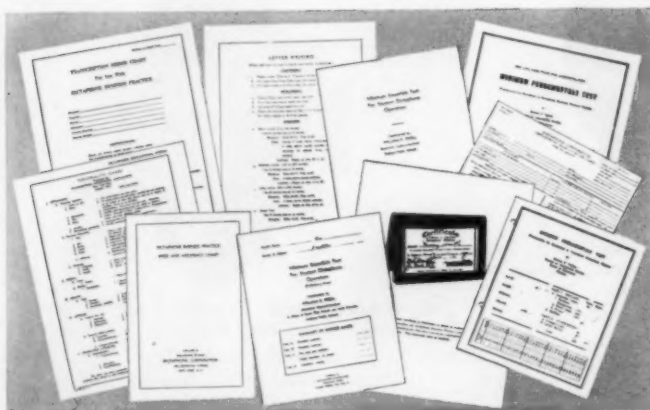
# DICTAPHONE CORPORATION

EDUCATIONAL DIVISION

420 Lexington Avenue, New York 17, N. Y.

## Wartime and Postwar Opportunities for Dictaphone-trained Transcriptionists

The unprecedented pace of American business has accelerated the demand for Dictaphone trained transcriptionists—girls who have been pre-trained now take over responsible positions immediately upon graduation. Dictaphone secretaries have proved themselves indispensable to busy executives.



### DICTAPHONE TEACHING AIDS

You can contribute toward relieving the acute shortage of Dictaphone transcriptionists and secretaries by encouraging your students to take the Dictaphone Business Practice Course and by scheduling your classes so that all available Dictaphone equipment is put to the greatest possible use. We will gladly help you in any way we can.

Series of 18 Practice Records	Final Transcription Test
Tedens Minimum Fundamentals Test and Teacher's Key	Certificate of Proficiency in Leather Folding Case
Individual Indication Slips	Student Employment Qualification Card
Odell Minimum Essentials Test and Teacher's Key	Letterhead Pads
Transcription Error Charts	Letter Writing Charts
	Speed and Accuracy Charts
	Personality Charts

THE AMERICAN SCHOOL AND UNIVERSITY—1944



### DICTAPHONE ELECTRONIC DICTATION ... A NEW BUSINESS EXPEDITER

The application of the new science of Electronics has provided a new method of dictation which retains all the advantages of Acoustic dictation and has the additional benefits of improved electronic recording.

Amplification by electronic tubes assures precision in the play-back and superior reproduction enables the secretary to transcribe with a minimum of mental strain and error.



### SPECIAL EQUIPMENT AND COURSES

Dictaphone also offers special equipment and courses for teaching typewriting and speech improvement, and is prepared to assist its customers with any difficult or unusual transcribing problems. Any Dictaphone representative will gladly supply information, or you may write us direct.

# UNDERWOOD ELLIOTT FISHER COMPANY

Former and Future Makers of Typewriters . . .  
Accounting Machines and Adding Machines

One Park Avenue, New York 16, N. Y.

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COMPLETE SERVICE IN ALL PRINCIPAL CITIES

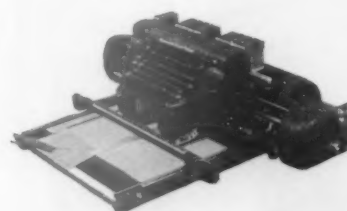
**YOUR TYPEWRITERS**, because of the present emergency, have become more valuable than ever. Your typists do their best to keep them at top efficiency by proper cleaning. But the best possible conservation measure is to take advantage of the Underwood Maintenance Agreement. This provides for *regular inspection* of your machines. It is, in effect, an insurance policy covering the efficient operation of your typewriters. Ask us for details.

**AND** better take care of those Underwood Elliott Fisher Accounting Machines, too! Remember this one thing. There is someone in the Underwood Maintenance Department always at the other end of the 'phone.

**WHAT** does this all add up to? Calling for Underwood Maintenance Service in time adds up to a heap of good sense . . . and helps your country. Today every Underwood Sundstrand Adding Machine is precious because it must be made to last longer. A Maintenance Agreement will do that and keep them in tip-top condition. And instruct your staff to call for Underwood service when any one of your machines gives less than its usual efficient performance.

## *Supplies, too, belong in your conservation program*

Did you ever think of how important they are at a time like this? For instance, you want ribbons and carbon paper that give the clearest possible reproduction with longest possible wear. The answer is Underwood Elliott Fisher supplies. Who else should you turn to for such supplies, but the maker of the machines themselves?



*Service Everywhere Through*

*A Nation-wide Organization*

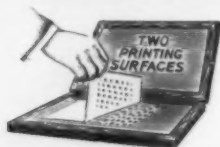
# THE HEYER CORPORATION

Quality Duplicators and Supplies Since 1903

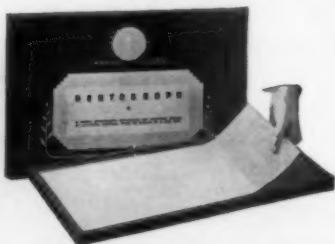
901-911 West Jackson Blvd.

Chicago 7, Ill., U. S. A.

**HEYER Quality Supplies will improve the work of any stencil, gelatin or spirit type duplicator. They are famous for their outstanding service and performance to business and educational institutions. Thousands of operators in schools and colleges now prefer HEYER Products, having proved by actual tests the superior qualities and greater economies made possible by 40 years of manufacturing experience.**



**HEYER IDEAL DUPLICATORS**  
Note - Letter - Legal - Folio Sizes.  
Complete with Ink, Sponge, Instructions



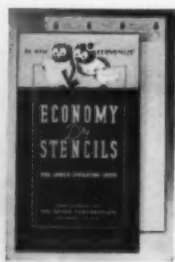
**HEKTOGRAPH DUPLICATORS**  
Note - Letter - Legal Sizes. Complete with Ink, Sponge, Instructions



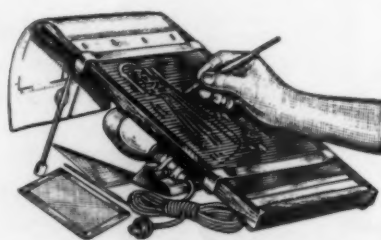
**HEYER Quality REFILL**  
For Any Pan Type—1-2½-5 and 10-lb. Can



**LETTERGRAPH Cellulose STENCILS**  
Top quality in Note-Letter or Legal Sizes



**ECONOMY Dry STENCILS**  
Good quality in Letter or Legal Sizes



**PORTABLE CLEAROSCOPE**  
Simplifies Drawing and Tracing on Stencils. Complete with all tools



**HEYER Quality INKS**  
Always make a good impression. In black and 7 colors

## PROMPT DELIVERIES

The items illustrated here are only a few of the many HEYER Quality Products now available from your school supply dealer. Send for our new circular which contains everything you need for Stencil Duplicators—Gelatin Duplicators and Spirit Process Duplicators. And regardless of the make of duplicators you may have, HEYER Quality Supplies will insure the most perfect results in duplication.

## HEYER EFFICIENCY ROLL DUPLICATOR

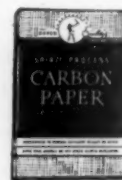
**Will Again Be Available September 1, 1944**

We are happy to make this announcement, because our Efficiency Duplicator is one of our most popular machines for the school field. And just as soon as the other necessary raw materials are released, we will resume the manufacture of other models in our line.

*Write for Circular SU44  
Containing HEYER Available Line*

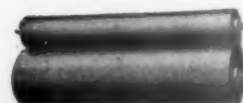


**HEYER LETTERING GUIDES**  
Make work look professional. Wide range of type faces and sizes. Also styli in 18 varieties of points, moulded plastic handles



**SPIRIT CARBON PAPER**  
For sharp, clean originals in Purple, Red, Green or Blue. 100 Sheets to a Box

**BRILLIANT COPYING FLUID**  
Assures maximum number of copies—no odor—gallon cans



**HEYER GELATIN ROLLS**  
In amber or white for any model duplicator. Sizes 8¼" to 22" widths. Gelatin Films for all Machines

**ORDER FROM YOUR SCHOOL SUPPLY DEALER TODAY!**

**THE AMERICAN SCHOOL AND UNIVERSITY—1944**



# MILLER-BRYANT-PIERCE

Aurora, Illinois

Established 1896

Division of L C Smith & Corona Typewriters Inc

Direct Branch Service

MANUFACTURERS

of

Typewriter and Other Inked Ribbons . . . Carbon Papers  
Stencil Inks . . . Duplicating Forms



## A LESSON IN THE APPLICATION OF EDUCATION

STUDENT: A learner.

SCHOLAR: A learned person.

POPULARITY: Approval by the people.

A STUDENT becomes a SCHOLAR by grinding into a finished formula two ingredients . . . TIME and EFFORT—concentrated continuous effort.

A SCHOLAR becomes POPULAR by finessing into realized success two essential elements: the IDEAL he plans to make a REALITY; the MATERIALS he employs to develop that REALITY.

A startling parallel pertains between the elements essential to produce a popular personality and the elements essential to produce the material ingredients of that popularity.

For nearly half a century Miller-Bryant-Pierce has devoted concentrated and continuous effort to maintaining its basic ideal of operation: To provide a BETTER typewriter ribbon, a BETTER carbon paper, a BETTER duplicating medium for every INDIVIDUAL machine writing requirement.

The always increasing demand for Miller Line writing media attests the soundness of this operating policy.

## THE MILLER LINE WITHSTANDS COMPARISON

### INKED RIBBONS

—made regularly in all standard colors and standard color combinations, record or copying, and in seven different degrees of inking, for any machine requiring an inked ribbon:

Typewriting Machine Ribbons  
Hectograph Ribbons  
Billing Machine Ribbons  
Bookkeeping Machine Ribbons  
Adding Machine Ribbons  
Pollard Alling Ribbons  
Tabulating Machine Ribbons  
Photolithographic Ribbons  
Speedaumat Ribbons  
Addressograph Ribbons  
Dating Machine Ribbons  
Time Stamp Ribbons  
Time Clock Ribbons  
Inked Ribbons for Multigraphing

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THE AMERICAN SCHOOL AND UNIVERSITY—1944

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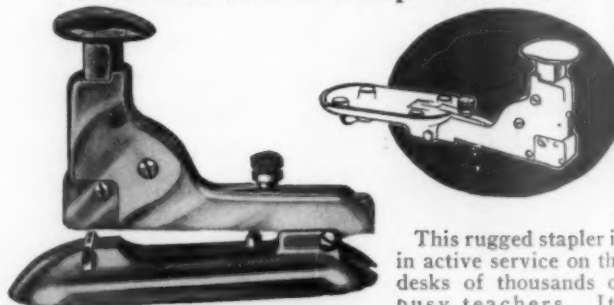


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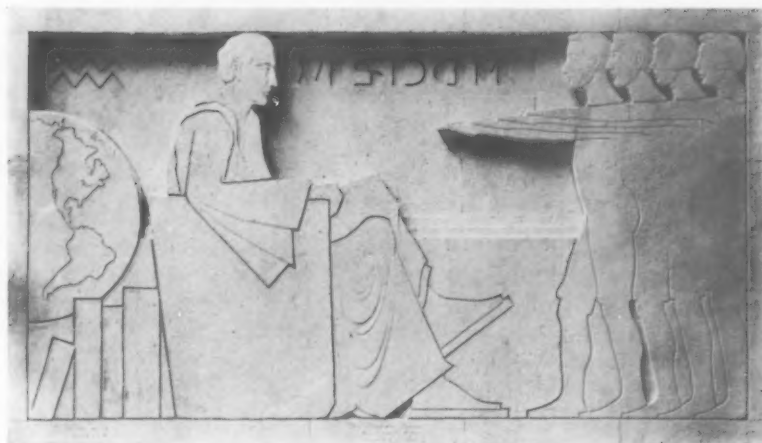


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## MANAGEMENT

*"Logistics" has become one of the striking words of this war period. It might be translated freely as meaning the art of getting necessary materials to the right place at the right time. Logistics, therefore, has an important significance to the school administrator. It has always been one of his major problems. In the post-war period it undoubtedly will take on increased significance. This section of the AMERICAN SCHOOL AND UNIVERSITY has for its purpose the presentation of information and the discussion of certain problems related to the management phases of school administration.*



# THE LOGISTICS OF THE PUBLIC SCHOOL SYSTEM

By N. L. ENGELHARDT

**L**OGISTICS suggests a reasoned, calculated, planned process. It implies comprehensive and detailed knowledge of all phases of the work involved. Its success is based upon understanding gains, anticipation of needs, timeliness of action, readiness to adapt to new situations, constant investigation and research, willingness to discard the obsolescent and to experiment with the new. This is as true of an educational as of a military enterprise.

Logistics, in its common military sense, has caught the public imagination. The scope of the service—the acres of jeeps and peeps, the ocean bridge of convoyed ships, the mountains of shoes, the supply piles on newly occupied shores, the thousands of planes and tanks, the millions of small arms and countless numbers of an infinite variety of other supplies—is breathtaking. But, if the transport and supply problems of the school enterprise of our nation could be brought together as a whole, the magnitude of the task might be equally staggering. There would be pyramids of books, highways of buses, tons and tons of paper, numberless cases of crayons, forests of pencils, millions of small tools, an unbelievable assortment of machines, large and small, enormous storehouses of foods, and an ever-extending list of other materials needed in the educative process. The term logistics is thus aptly suited to educational use.

## Integration Is of the Essence

The logistics of an army must be integrated with the tactical and strategic purposes. The same is true of a school system. Logistics is a branch of service that cannot stand in isolation. When materials are needed in action, they must conform to use specifications. Logistics is a service that cannot advance on alibis, ignorance, personal interpretation or traditional practices.

A school system makes the greatest gains when all physical needs, whether of plant, supply, or transportation are worked out as a result of planned processes. The logistics of a school system must include all three factors, and workers in a school system should understand the associated relationships and the singularity of purpose of their entire enterprise.

## The School Plant

In logistics, the school plant looms large as a problem. The day is gone when the school building can be planned by an architect and a school committee working in terms of their traditional concepts of a schoolhouse. A new type of schoolhouse is slowly evolving. Its size, the character of its spaces, the relationship to its setting are all being affected by the community's ideas of what the education program must be. Communities must learn to discard the obsolete school plant and develop that which most assuredly advances all the educational interests of their people. The logistics history of the war has been one

of constant adaptation. As splendid examples take the L. C. T.'s, the two-man bazooka gun, or even the parachutist's shoes.

In logistics, each of the materials collected at a supply depot has a specific task to perform in the accomplishment of a single purpose of the command. In the school plant a wealth of curricular substance is ignored or just lying around unused. Rarely is the building design, the ornamentation, the construction, or the space assignment made a part of the educational curriculum of the school which has been housed. Effort should be made to conceive of the heating plant, the plumbing layout, and the electrical layout as part of the teaching equipment of the school. Corridors should be planned to make a real contribution to the educative process. Of course, this type of planning requires skill, understanding of education, and imagination.

Likewise, limited, traditional notions of how to use a school site should give way to real experimentation with this valuable educational asset. The imagination and initiative of the educator should be stirred to make land a more productive factor in the educational program. Educational logistics requires a complete use of land. The school which teaches the geography of its state by interesting its children in laying out a miniature state on the school grounds should be highly commended for securing returns from the community's capital investment.

The school plant should not merely house the educational program. In a real sense, it should be made part of the educational program.

## Equipment Management

School equipment management may become a cut and dried affair in any school system. Specifications are written frequently by persons who know little about the educational process and who have not spent an hour in a curriculum workshop. Purchases are made, equipment installed, and subsequent use is assumed to bring undefined results. This certainly does not conform to any principle of logistics which the reader would like to sponsor. How should a school system define its equipment needs? That is a question, the answer to which will bring scores of equally puzzling questions. How should a school system plan to get the maximum of return from its equipment before it has become outmoded or declassified? What should the children be taught about the making and use of the equipment they have about them? Should an equipment syllabus be developed for a school system? Is equipment purchased just for one educational result and are the concomitant learnings ignored? Think of the drill press or the motion picture machine, the shaper or the vacuum cleaner, the mimeograph or the world globe, the radio set or the thermostat, even the pupil's desk and chair, and consider the many phases of learning associated with their

history, present production, and future development.

Equipment wears out in five to ten years. Has the fullest possible educational value been secured? Good logistics makes equipment management one of the most intensely educational phases of school work. It taps all the inherent values and contributes a maximum to the student's understanding of the world in which he lives and works.

Good logistics for a school system may differ in some respects from that for any other service, for the school system's aim is education, more education, and all possible education throughout the learning periods. The school endeavors to secure the greatest possible educational return from every dollar spent. The questions raised are: Is it being done? If not, how can it be done? What resources are being left untouched?

#### Supply Management

Logistics keeps education abreast of the times. Supplies, like guns, cannot be standardized for all time. A better program of education may require less but certainly more pertinent materials. Those in charge must know the results of educational research having bearing upon plant supply and equipment problems. They provide sound films because they teach more and better. They provide air-age maps because for today's understanding the mercator maps no longer suffice. They buy less of chalk and more of paint because educational experience has shown the advantages. They never turn down a request on the grounds that "those things have never been purchased before" but turn attentive ears to teachers' requests which have the earmarks of exploration, experimentation, or adaptation from proven practice.

The mechanics of supply management—careful and timely buying, delivery at point of need before the need arises, distribution in terms of use standards, protection from waste, freedom from hoarding through adequate inventory and skillful anticipation of needs in requisitioning—are only a limited part of the program, however. All the supplies imaginable delivered to one school may have slight educational returns as compared with a limited quantity of supplies sent to a second school which are directly and fully integrated with curriculum and method.

The school supply field has teemed with new and vital problems of production, distribution and priority since the war began. In high schools, particularly, a course in supply management would spread more widely essential understanding concerning this phase of the logistics program. Teachers on the frontiers of educational methodology have demonstrated that even grade children may learn about the materials they use and make those materials in a limited way.

Educational values inhere in all work in a school system. The educator's task is to uncover them.

#### More Zest to Teaching

A broader appreciation of the place of plant, equipment, and supply in the total educational process is now in the developmental stage. It will expand rapidly, but only as imagination and experimentation are encouraged. Building a school structure, purchasing standardized equipment, and carrying out the traditional supply program are worthwhile tasks, but such work has more zest and challenge and value as the complete integration with a meaningful educational program is being achieved.

# HOW LONG SHOULD A SCHOOL BUILDING LIVE?

By T. C. HOLY\*

Bureau of Educational Research, the Ohio State University



Fig. 1. John Simpson Junior High School, Mansfield, Ohio

TO answer the question "How long should a school building live?" involves some of the same difficulties in answering the old question of "How old is Ann?" More specifically it falls in the same category of a question such as "How long should a suit, a pair of shoes, an automobile, a house, and the like last?" The obvious answer to such a question is "until they are worn out." The difficulty arises when one attempts to determine when an article of clothing, a car, a house or any other article is actually worn out.

Just when a school building has reached such a condition that it is no longer suitable for use is subject to many variables. Because of these many variables there is no absolute answer to this question. In the discussion which follows some factual materials, illustrations, and other information bearing on this topic are presented.

## Expert Opinion

The Educational Finance Inquiry Commission which functioned under a grant from one of the foundations during the period 1922 to 1925 gave considerable attention to ascertaining the lifetime of a school building. Their purpose was to arrive at the annual depreciation rate for capital outlay expenditures. The commission tried two methods for answering this question. Quoted from one of their publications is the following:

The first method of attacking this problem was to secure the opinion of as many specialists in the field of educational administration as was possible. The estimates of these men as to the life of school buildings ranged from 50 to 100 years with the central tendency strongly marked at 70 to 75 years. In the absence of definite statistical facts establishing the average life of school buildings, the opinion of these specialists has been considered of great importance in arriving at the best possible figure.

The other method was to place before an accepted real estate authority complete facts with regard to the ages and

types of construction of the school buildings in the State of New York and to secure from him an estimate as to the probable life of each group of buildings. The person invited to act in this capacity was Mr. Frank Lord, of the Cross and Brown Company, who, through long experience in this field, has established an enviable reputation as a competent judge of the value, length of life, and rate of depreciation of buildings. With all the available facts concerning the school buildings of the state before him, Mr. Lord reached the conclusion that the best figures to express the length of life of school buildings in the State of New York would vary from 50 to 75 years with the location of buildings and type of construction. He ratified the use of 75 years as a single figure for the life of school buildings.<sup>1</sup>

## Studies of Actual Practice

In terms of actual practice the 75 years for the life of school buildings as arrived at by the Educational Finance Inquiry Commission is too long. In 1926 when director of housing and equipment in the St. Louis schools, I made a study in that city of the age of buildings which had actually been replaced during a 30-year period. This figure was about 47 years. Also at the same time an analysis was made of a number of school building surveys made in other large cities to see the age of buildings recommended for replacement in those studies. The figures found ranged from 45 to 50 years. It would seem, therefore,

\* Author's note: The writer is indebted to the following persons for the illustrations used in this article: W. L. Miller, superintendent of schools, Mansfield, Ohio; Samuel D. Jones, business director, Louisville, Kentucky, Public Schools, and T. J. Higgins, assistant director, Bureau of Research and Building Survey, Chicago Public Schools.

<sup>1</sup> William F. Russell, Thomas C. Holy, Raleigh W. Stone et al. *The Financing of Education in Iowa. A Report Reviewed and Presented by The Educational Finance Inquiry Commission under the auspices of The American Council on Education.* New York: The Macmillan Company, 1925, p. 171.



Fig. 2. George D. Prentice School, Louisville, Ky.



that in terms of current practice the 75-year age limit is too high. Again, this is conditioned by a large number of variables, some of which will be discussed later in this paper.

In a school building survey for Hillsboro, Ohio, an exempted village school district of about 4000 population, which the Bureau of Educational Research made in 1932, there was found in that village an elementary building then 65 years old. Because of its structural condition which was unusual for a building of that age certain comments were made in the report. Quoted from that survey is the following:

For a building 65 years old, the original Webster building is in a remarkably good condition. While it is naturally obsolete from the standpoint of present-day elementary school buildings, yet the foundation, walls, floors, stairways and other parts are exceedingly well preserved. From the standpoint of construction, it is in as good a condition as the Annex, erected almost 50 years later. However, it should be remembered that a good building does not necessarily make a good school building. The needs as expressed in terms of the educational program should be adequately provided for in a school building. Unfortunately neither the Webster building nor the Annex is adequate to house the kind of elementary program which should be provided for the children of Hillsboro.<sup>2</sup>

Another example of a building which from external appearances ought to have been serviceable for many years was found in a school building survey of Mansfield, Ohio, made in 1938. This building, the John Simpson Junior High School, is shown in Fig. 1. Judging by appearance, the building ought to serve the schools of that city for a considerable period of time. Actually, however, its adequacy in terms of housing a junior high school program was woefully weak. Quoted from this survey report is the following:

The John Simpson Junior High School plant is in distinct contrast with the Senior High School, scoring higher only in accessibility. Built in three instalments (1891, 1903, and 1922) and used for a number of years as a four-year high-school

<sup>2</sup> T. C. Holy and Wm. E. Arnold, *A School Building Survey for Hillsboro, Ohio*. Bureau of Educational Research, Ohio State University, 1932, p. 39. (Typewritten Report)



Fig. 3. Margaret Merker School, Louisville, Ky.



Fig. 4. Paul Dunbar School, Louisville, Ky.

building, it was converted to its present use in 1926 when the Senior High School was completed. It was not well suited for the program of a senior high school; it is even less suitable for younger pupils. . . . The halls are wide with wooden floors and wooden stairways. . . . The third-floor classrooms are distinctly cramped to fit into the architectural style of the building, and are attic-like in appearance and utility. The cafeteria is in a small dark basement room with little natural light and a low ceiling. It seats 64 people whereas more than 300 pupils patronize it daily. Classrooms are used to supplement the cafeteria space at noon. The five basement rooms which care for academic classes and industrial arts activities are poorly lighted and poorly ventilated. The cloakroom for the corner basement classroom is pitch dark, having no window or electric light. The pupils must open wide the door into the classroom and then strain their eyes in order to see the wraps hanging on the hooks. . . .

The John Simpson building is so constructed that it cannot be remodeled into a first-rate building. Although the exterior walls are good, it is our judgment that the cost of rehabilitating it into a satisfactory junior high-school building is out of proportion to its worth.<sup>3</sup>

Because of that conclusion this building was recommended for replacement which was done in 1938. Examples of this kind may be found in most any city. Unfortunately there is little other use that can be made of abandoned school buildings. Boards of education generally have two alternatives, i.e., either close up such buildings and hope some other use can be made of them or tear them down. In the case of this building it was torn down. A new junior high school building now occupies the same site.

During the early part of 1943 I had the major responsibility for the school plant section of a comprehensive survey of the schools of Louisville, Kentucky. In studying the buildings of that city I was struck with the number of old buildings which structurally were in good condition. Fig. 2 shows the George D. Prentice School which was erected in 1836 so has been in use 107 years. Although this building was given a general overhauling in 1915, the main structure is the same as when erected more than 100

<sup>3</sup> T. C. Holy, Earl W. Anderson, Eldon B. Sessions, *A School Building Survey of Mansfield, Ohio*. Made for The Mansfield Board of Education. Bureau of Educational Research, Ohio State University, 1938, pp. 27-28. (Mimeographed)

years ago. From outward appearances this building would stand perhaps another 100 years. It scored 473 points out of a maximum of 1000 which for a building of that age is most unusual. Despite its age its condition was such that it was recommended that it be continued as one of the permanent elementary centers in that city.

Another building also in Louisville, Kentucky, is the Margaret Merker School (see Fig. 3) which was erected in 1853. This building, a three-story structure, scored 473 points which for a school of that age is very good. It, however, because of its almost complete lack of any of the educational features now thought essential in an elementary school building was recommended for replacement. However, in so far as the gross structure is concerned, barring fire or storm, it would stand another generation.

A third building taken from the Louisville system is shown in Fig. 4. This is the Paul Dunbar School erected in 1853. It is now 90 years old. It scored only 403 points out of a maximum of 1000, primarily because of its many educational shortcomings. Therefore it was recommended for replacement. Structurally, however, it would undoubtedly stand for another half century.

These three buildings taken from the Louisville system were undoubtedly models of good schoolhouse planning when built nearly a century ago. At that time, for example, a site of sufficient size on which to locate the building itself was regarded as adequate. Surrounding these small building sites was plenty of vacant space so that the children had adequate play space. Moreover, they have no closets or built-in

cases. They were, of course, of non-fireproof construction with various types of heating systems. Originally all were heated by stoves. Later furnaces were installed. Originally they had no physical education rooms, cafeteria, or special rooms of any kind.

Fig. 5 shows the Jones Elementary School in the city of Chicago. This school was built in 1874 so is now 69 years old. From the figure it will be seen that it is a four-story structure with rather ornate window headings. Some five years ago it was given a rather thorough rehabilitation and is now used as a commercial high school. This rehabilitation, however, did not involve structural changes but included installation of linoleum floors, new electric lighting, plastering, decorating and a complete overhauling of the heating plant. Because of these improvements and the general condition of the building it will no doubt continue to be used for a considerable time. It is interesting to note the size of the site which contains only .4 acre. It will be seen that it is very close to a large paper company on the one side and a small apartment house on the other. Obviously with a site of that size it has practically no play space.

Another building, the Langland School, also in Chicago, is shown in Fig. 6. This building was erected in 1888 so is now 55 years old. It is located on a site containing only .83 acre and now houses an elementary school and continues to use a combined assembly and gymnasium located on the third floor. So far as external conditions are concerned this building will stand a long time. It, of course, is of non-fireproof construction and like all old buildings is characterized by very large classrooms and many cubby holes for individual work. Many of these features, however, are desired by teachers. For example, in a school building survey in the city of Columbus, Ohio, there was found an elementary building which consisted of an old unit and a relatively new one. Because of the decline in enrollment in the district served by this school it was found that one of the units could be abandoned. On inquiry of the teachers which they would prefer to use they were almost unanimous in their judgment favoring the old units. The reasons



Fig. 5. Above—Jones Elementary School, Chicago, Ill.



Fig. 6. Right—Langland School, Chicago, Ill.



Fig. 7. Elementary School, Chicago, Ill.

they gave were the larger rooms, higher ceilings, and adequate work space.

Fig. 7 shows a new four-room elementary unit which is now being used in the Chicago schools as a standard unit. Although this unit contains no gymnasium or assembly hall, the plant is so designed that these facilities along with other classrooms and special rooms can be added as the community develops. It is of much cheaper construction than the larger buildings and very efficient to operate. It has a low pressure steel boiler and the entire operation of the building requires only one janitor. Because of the low original investment in a building of this type, it might be much sooner the more expensive structure.

#### Educational Program and Obsolescence

In the foregoing discussion frequent comment is made that the buildings used for illustrations were in good structural condition and might, therefore, continue to be used for a good many years. Moreover, all of them except the four-room unit in Chicago were buildings ranging from 60 to more than 100 years of age. From the point of view then of the building itself, school buildings might well live a 100 years or more.

This raises the question of factors other than structure which enter into the picture in answering the question "When should a school building be replaced?" These other factors are often spoken of in terms of "obsolescence." According to Webster's International Dictionary obsolescence is defined as "the state or process of becoming obsolete." In the field of accounting it is defined as "depreciation of existing machinery or plant due to the invention of new and better processes or machinery." Although that definition is applied to the field of accounting, it fits pretty well the problem at hand. Most school buildings are replaced not because the walls, floors, ceiling, and other parts of the building are actually worn out but because the current educational program requires facilities not included.

R. G. Jones who was superintendent of the Cleveland schools between 1920 and 1933 advocated that because of the rapid changes in the educational pro-

gram school buildings should be of a somewhat temporary character. He thought that they should be of frame construction so that in 20 or 25 years they could be abandoned and replaced by buildings better designed to house the current educational program. He made no headway on this chiefly because of the state building code requirements and city ordinances which present the main difficulties in carrying out any program along the lines he advocated. This same idea is now being suggested by Claude V. Courter, superintendent of schools in Cincinnati, Ohio.

#### Other Factors

Other factors which affect the answer to this question as to when a school building is worn out is the ability of the district to finance a new building; the character of the educational program in the community, that is, does it require facilities different from those found in the old building; the quality of the educational leadership, the general attitude of the community toward public education, and general economic conditions.

Unfortunately in the past the common practice has been to erect buildings during high prices and pay for them during stringent times. For example, during the early years of the depression before the federal government undertook the PWA program little school building construction was done, especially in those districts where it was necessary to vote bonds. Obviously, with low building costs and heavy unemployment that would have been an ideal time for school building construction.

#### Flexibility of Design

Referring now to the original question "How Long Should a School Building Live?" it is my judgment that buildings as now constructed will last from 50 to 75 years. Obviously, in that period there will be many changes in the educational program. In order, therefore, to make the building as adaptable to these changes as possible much emphasis should be placed on flexibility of design. Even with that, however, the building will undoubtedly continue to be an important factor in shaping the educational program.



# FINANCING THE SCHOOL PLANT OF TOMORROW

By JOHN W. LEWIS

Assistant Superintendent, Department of Education, Baltimore, Md.

**W**E are indulging in pretty dreams of the school plant of tomorrow. The realization of these dreams will cost money. Will the money be forthcoming?

The extent of the federal debt will depend upon the length of the war, but already it has assumed proportions which five years ago would have seemed unthinkable. Without doubt, federal taxation will be so heavy that John Smith, taxpayer, will be ready to join any movement for the reduction of state and local taxation. This will probably be joined with a concerted drive against increasing federal expenditure.

## Taxation Without Hardship

The problem of finance and taxation does not exist in a vacuum. The approach to it will be conditioned by the health and vigor of our whole economic system. If we are able to achieve full employment and keep our plants and machines operating at full capacity, we shall be able to produce enough for all our needs—and to spare. If we are prosperous we can pay heavy federal taxes and still afford a strong and vigorous program of education.

On the other hand, if we stop our machines and curtail employment because we don't like the figures our bookkeeping reveals, we will again go into an economic tailspin. With our economy in a state of stagnation—not to say disintegration—we would again enter an era of scarcity in the midst of possible plenty. Without adequate income all taxation would become doubly heavy and all expenditure for capital outlay or for current operation would encounter strenuous opposition.

## Factors Affecting Post-War Prosperity

The schoolman's stake in financing an adequate school plant thus is tied up with the solution of our fundamental economic problems after the war. The role of prophet is at best hazardous, but we must make the best forecast possible of the factors which will affect the post-war situation. What is the likelihood of a prosperity which will insure an adequate tax program for the support of an adequate school plant?

One favorable factor will be the backlog of accumulated consumer demand for automobiles, household equipment, deferred maintenance and replacement. New improvements in design and performance will

certainly increase this demand. New housing will also contribute its part, if conditions make its financing possible. The demand for capital plant expansion is likely to be somewhat restricted, but programs of modernization should be extensive. These factors add up to a powerful stimulus to business activity. Then too the average citizen has learned a lot since 1929 and may be more receptive to measures which may be advanced to improve the economic picture.

On the other hand we are faced with the necessity of providing 10,000,000 more jobs than were available in 1940. The slowing rate of expansion of our economy, one of the fundamental factors in the 1929 disaster, is likely again to be a factor after our initial spurt. Slogans of return to individual initiative and enterprise and of keeping the government out of business, should not blind us to the fact that business had its head with little government interference when we hit the skids in 1929. Although business has learned much, it seems powerless of itself to solve the problem of full employment, without much greater vision and cooperation than has yet been shown.

## Achieving Full Employment

To solve our problems business must find the answer to several important economic questions. In peacetime, 60 per cent of our workers can produce enough for the 100 per cent at our usual standard of living. How are the other 40 per cent to get the money to buy what would be produced for them? How can we adjust our rate of savings to the reduction in rate of capital expansion? In the long run our total savings must approximate this capital expansion. If income is not put out in purchasing power for consumer goods and services or for capital investment, will the unspent balance mean that we have made a dollar's worth of goods but put out only say 97¢ in purchasing power to buy it? Any excess not bought may be the beginning of so called overproduction with the resulting vicious circle of reduced production with corresponding reduction in personnel and purchasing power. Without a solution to similar problems we head for depression.

Soon or late, there will again be the cry for government to save us. There will be objections to governmental expenditure in a works program, etc., because of the size of our national debt and because of the waste which will be charged to such expenditures. But

even the most reactionary is likely to change his tune if our economy is faced with stagnation and its foundations threatened. At what stage the works program comes, i.e., early in the dip or only after conditions have become extremely acute, will depend to great degree on the viewpoint of those in political control at the time.

#### **Financing Capital Expenditures**

Out of such a program of public works will undoubtedly come support for a building program to give us our school plant of tomorrow. We must not assume however that federal subsidy by a percentage grant is the complete answer to our prayer. Many communities having greatest need of new and improved school plants will not be able to finance their share of the cost. Other communities which might be able to contribute their percentage will hesitate to embark on capital expenditure, increasing debt service at a time when it is difficult to meet current operating budgets.

This condition raises the whole question of our tax structure. The federal government has preempted the field of the best and easiest sources of taxation, taxes on income, excess profits, liquor, tobacco, amusement, luxuries, etc. The state gets the second choice bite. The local community—on which the citizen relies for his most immediate services of government—education, health, police and fire protection, street cleaning and lighting, sewage, etc.—must rely primarily on a property tax. With heavy loads of debt service, with shrinking assessments in cities, rotting at the core, and with demands of operating costs, the limits of a property tax have been reached if not exceeded. If such communities embark on heavy capital expenditures to take advantage of a works program, one of two alternatives must be faced: (1) curtail operating expenditures for essential services, including education, or (2) secure greater state and federal subsidy. In most communities, therefore, there is likely to be

extreme caution on capital expenditure until there is assurance of increased revenue.

#### **Will Education Get Its Share?**

One other problem must be faced, viz., education must get its fair share of whatever expenditures are made at the federal, state and local levels. Pressure groups, having a selfish stake in a particular type of expenditure, are already working to insure their getting as much as they can, regardless of the relative social value of the expenditure. Why spend all our money on roads, bridges, or post offices? One element in getting our share of what money is available is to have our program ready to go at the same time others are ready. Another factor is to convince the community of the relative importance of education. Citizens must be taught that education is the foundation on which our social, economic, and political stability rests. They must also be convinced that in the long run in education they get about what they pay for.

#### **Can Prejudices Be Discarded?**

Is the outlook bright for adequate financing of the school plant of tomorrow? Frankly, I don't know. It will depend to such a large degree on the extent to which the American public can throw off its prejudices and inherited patterns of thought in the solution of our economic problems, which are now more complex than ever before in our history. Our chance for coming through without too much suffering would be brighter if our educational program of the past forty years had been financed sufficiently to draw the cream of the crop for our teachers and educational leaders. Our standard of civic efficiency might then have been high enough to meet the present challenge. We must lift ourselves by our own bootstraps. Without adequate support the schools cannot fulfill their responsibility, and until they fulfill their responsibility of giving an adequate standard of citizenship, our chance of adequate support is not too bright.



*Photos courtesy National Fire Protection Association*

# THE SCHOOL INSURANCE PROGRAM

By N. E. VILES

War Relocation Authority

Washington, D. C.

**D**URING recent years school administrators have evinced an interest in the study of school insurance problems. Many excellent articles have been written on various phases of school insurance. Some of them gave illustrations of certain local practices, others were devoted to some particular phase of the program. In general these articles and studies did not provide for the school administrator a composite outline of procedures in administering the program. It is intended that this article shall provide a general outline of suggested procedures, some explanation of general principles, and a few suggestions on the organization of the program.

## SOME SUGGESTED STEPS IN ESTABLISHING AND MAINTAINING THE LOCAL SCHOOL DISTRICT INSURANCE PROGRAM

- A. Determine whether insurance is needed or desirable.
  1. Obligations of the school unit
  2. Obligations of local school administrators
- B. Determine the types of insurance protection needed.
  1. Property: fire, windstorm, theft, boiler, explosion
  2. Liability and casualty
- C. Determine coverage to be purchased.
  1. Establish value of property to be protected
  2. Estimate coverage needed to protect the district
- D. Organizing the local program.
  1. Types of policies to be written
  2. Writing the coverage
    - (I) Possible economies
    - (II) Expiration dates
    - (III) Selection of contracting companies or agencies
    - (IV) Size of policies
- E. Evaluation of program.
  1. Maintaining records

## Need for Insurance Protection

School boards and other school administrators have an obligation to protect the district or unit from unnecessary or avoidable loss. There seems to be almost no tendency to hold school officials responsible for losses resulting from negligence or the absence of ordinary protection. Likewise there seems to be little tendency to hold school districts liable for personal injury claims. On the other hand, school officials are entrusted with the administration of the financing program of the district. In this capacity they have an obligation to preserve and protect the property of the district. In some large or wealthy districts where

the value of each individual property is equal to only a small part of the capacity of the district to provide at once funds to replace the property lost, school district officials may deem it desirable for the district to carry all of the risk. In other districts where the task of providing funds to replace any properties that may be destroyed may create a hardship upon the taxpayers the school officials usually deem it advisable to spread the risk by purchasing insurance protection.

Insurance is a method of spreading the risk. School administrators need to understand this principle and its use as a basis for planning the local insurance program. Regardless of the procedure followed, whether by neighborhood donations, cooperative contracts to contribute, or pre-collections of reserve funds on a fixed fee basis the purpose is to make available, when needed, assistance from many to reduce the burden of loss to the owner.

## The Type of Insurance Protection Needed

Theoretically, the school districts might be able to build up sufficient reserves in cash or in free taxing power to replace losses. This is one form of self insurance. Taxpayers' criticism of large public reserve funds, the delays met in calling special tax levy elections, and the probable lack of free taxing capacity often make such procedures impractical. Hence, most school districts do purchase insurance protection. For these districts it is necessary to purchase a type of insurance coverage that will give the protection desired.

## Casualty or Liability Insurance

There seems to be no general agreement on the liability of a school district for personal injuries. Many school officials feel that the school as a unit of the state can accept no liability obligations and that the purchase of liability insurance is not within the purview of their authority. On the other hand, the increase in the school pupil transportation programs, set up in many cases on a semi-compulsory basis, has raised anew the question of the responsibility of the district to protect the children. If possible the local school officials should determine, for their states, the following points: (a) is the district



liable for personal loss or injury, (b) is it legal to spend school district money for such insurance, (c) will the purchase of such insurance provide any protection if the district is not liable?

#### *Property Protection*

Most schools do purchase insurance protection against property loss. Hence, the following part of this article will be devoted to this type of insurance coverage. The principal types of school property insurance are fire, tornado, boiler or explosion, and theft. There are several variations or combinations of these basic types. Most school districts purchase fire and tornado insurance protection. Some purchase theft insurance for specific items. Many districts also purchase boiler explosion insurance which is primarily property insurance but which also provides boiler inspection services.

#### **The Coverage Needed**

In determining the coverage needed for each school building it is necessary to establish the value of the property to be protected. The first step is to determine the replacement cost of the building if it were to be erected now. From this value a deduction should be made for depreciation for the time the building has been in use in order to determine the present worth. The rate of depreciation will depend on upkeep, condition, and the anticipated useful life. There are many plans of computing the rate of depreciation but probably none of them are more reliable or more easily applied than the straight line method. From the present worth it is permissible to deduct for certain so-called non-destructible items such as excavations, foundations, footings, and piping below the lowest floor level at each point in order to determine the insurable value. When once developed this insurable value may be re-established for a period of several years by adjusting values on the basis of the fluctuations in the indices of building costs and by extending the depreciation estimates.

After establishing the insurable value it will be necessary to determine what part or percentage of

this value should be covered by insurance in order to give the protection desired. School boards serving as district trustees in charge of public property usually deem it desirable to write sufficient coverage to protect against any probable loss. It is usually easier for such officials to justify an expenditure for protection than to defend an unprotected loss. There seems to be no general agreement on the most desirable coverage percentage. Many districts write a coverage of at least eighty per cent of the insurable value. This seems sound, and under a properly organized program can, in protected areas, be purchased for little more cost than that paid for less coverage. In general the amount of coverage should be that needed to protect the investment of the district. This does not imply that coverage on old buildings should be sufficient to replace with new enlarged or improved buildings.

#### **Organizing the Local Program**

The local program should be so organized that the maximum protection may be obtained at a reasonable cost and with a minimum amount of administrative time devoted to the supervision thereof.

#### *Types of Policies or Contracts*

Local administration of the program may be simplified by establishing a program routine and by adopting a uniform system of policy writing. Coverage may be written on specific policies with each to provide specific amounts of protection on specific risks. This procedure, while flexible, requires much local supervision and bookkeeping. Blanket policies may cover specific amounts of all properties owned and are written at an average overall rate. These have some advantages but are difficult to administer and are not recommended or permitted in certain areas. The specific schedule policies have most of the advantages of the first two and are easier to administer. Under these policies each risk is covered by a specific amount at published specific rates. All district property or groups of similar properties may be grouped into one schedule with coverage for each specified. Average rates are computed on the basis of

Facing Page—The burning of Dickinson Hall in Princeton University was costly—Irrreplaceable works of art and historic collections were destroyed

Right—Fortunately six hundred children had left this building for their noon recess when fire broke out. The Victoria School, Winnipeg, Manitoba



the factors involved and each policy of each agent or company assumes an allotted amount of the total coverage listed. For the companies this has about the same effect as blanket coverage. For the school district it has about all of the qualities of specific coverage with the added advantage that all policies are computed at a common rate and that it presents at a glance a composite picture of all coverage on all risks.

It is also necessary to determine whether the different types of coverage are to be written separately or are to be combined on one policy form. Combining different amounts of two or more types of coverage for one risk on specific policy contracts often brings confusion. This does not apply to the schedule forms. There is now available a supplemental policy form which when attached and made a part of the fire insurance policy provides extended coverage including windstorm, explosion, and other loss protection. The added cost for this extended coverage is slight and many districts take advantage of the oppor-

ing coinsurance contracts. Many school districts now write coverage equal to or more than eighty per cent of the insurable value of the property. By writing such coverage under coinsurance contracts a saving of from twenty to thirty per cent for non-fire resistive and as much as seventy per cent on fire-resistive buildings may be made in costs for fire protection. On tornado protection this saving may be as much as eighty per cent. In writing such contracts the local officials should establish the insurable values of the property to be protected and should maintain coverage equivalent to the minimum necessary to satisfy the conditions set up in the contract, that the district will not be obligated for any share of the coverage written.

School officials should understand the composition of the rates on each building and should endeavor to have these rates reduced to a minimum. School building insurance rates have been discussed in some detail by the writer<sup>1</sup> in previous publications and it is sufficient to state here that substantial savings may be



The interior of Deering High School, Portland, Maine, after it was swept by fire in May 1921. Note the wood construction

tunity to include nearly all coverage in one policy form. Boiler insurance policies are generally written separately from other schedules.

#### *Writing the Coverage*

In writing school building insurance it seems desirable to take advantage of all possible savings that do not decrease the amount or quality of the coverage purchased. Districts may realize a saving by the purchase of term policies. The average annual cost of three-year term policies is one-sixth and for the five-year policies one-fifth less than the cost for one-year policies.

Another substantial saving may be effected by writ-

effected by rate reductions. It is therefore worthwhile to strive for whatever reduction is possible.

#### *Expiration Dates*

The local program should be so organized that approximately one-third or one-fifth, depending on whether three- or five-year term policies are written, of all coverage expires each year. It is also desirable that all of these policies expire on some one selected date each year. If this is done school budgeting of insurance expenditures is simplified and the board can

<sup>1</sup> Viles, N. E. "Improving the Insurance Program in the Local School Districts" the author 1934, 100 pp.

handle all insurance problems, other than losses, at one meeting during each year.

#### *Selection of Contracting Agencies*

As stated previously a principle of insurance is the distribution of the risk. A school board writing all of the district coverage with one company or agency has transferred the risk but may not have distributed it. This agency may re-distribute by reinsurance. Since the board may not have ample assurance that such re-distribution will be maintained it seems preferable for the board to make the initial distribution and to select the contracting agencies. Adherence to this policy would make it desirable to limit individual policies to reasonable amounts.

The local school officials as trustees for public funds and public property should contract insurance only from companies or organizations having ample assets and reserves to give fair assurance of providing the protection needed. It is not desirable to discuss here the controversial question of mutual insurance for schools. It seems evident that the schools should make insurance contracts with only those companies or organizations having liquid resources, and having authority to make valid contracts with fixed payments and without requiring the district to accept any obligation for possible future assessments. Similarly the school officials should not be forced to purchase protection through every local agency having a license, but should be free to select those agencies qualified to render some service to the district in the whole insurance program.

#### **Evaluation**

The total insurance program should be reevaluated

frequently. Construction costs and property values change. The district insurance record should be complete and up to date. It should be simple and compact that school officials may at a glance determine the status of the program, the anticipated expirations, and the future expenditure obligations.

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# THE TRAINING OF SCHOOL JANITOR-ENGINEERS

By L. W. WINKEL

Director of Kansas Janitor Engineers

and

LAURENCE PARKER

State Supervisor of Trade and Industrial Education

State Board for Vocational Education, Topeka, Kan.

WE hope that courses in school administration will place a greater emphasis on the selection and training of janitor-engineers. They should do so, as there is a fearful waste of time and money due to the incompetence of persons taking care of school buildings.

## Bases of Appointments

All sorts of men become janitor-engineers of school buildings. Too often a man is hired through political influence to take charge of a building. Such men come from all walks of life. Some have worked as bakers, painters, carpenters, plumbers, auto mechanics, farmers, grocery clerks, and at many other trades. They know nothing of heating or ventilating a school building. They have no knowledge of how and when to clean the rooms and corridors, no knowledge of janitor supplies, and methods of applying them. Their only qualification is that they have helped their party or someone who has been elected. He may be honest in his desire to do a good job; if so, training will help him.

Quite often a man is appointed janitor of a school because of pity, because of his age and financial condition. This man has reached the age where he is of little or no value in any job. In some cases he is in debt to a member of the board of education, who is a merchant, or a doctor. It is felt that they can kill two birds with one stone by giving the old man a job and, by using a little pressure, get some or all of

the money due them. This man may or may not have had any experience at this kind of work. He may be conscientious at his work, but due to his age, he is very slow, often cannot "see dirt," and in many cases does not have patience with students and teachers. In some cases he can be helped by training.

Another mistake board members make is to let the janitor-engineer work out to the lowest bidder. We have heard of a number of cases when this was done, and in all cases only a few were satisfactory. It seems as though each year someone from the town or nearby farm is willing to attempt the job for less money; someone who is inexperienced and must work his entire family in order to make a start at keeping the buildings clean. The standards of cleanliness of a farm barn are not the same as of a school building.

Only occasionally, outside the larger cities, are janitor-engineers hired because they are best qualified to do the work; men who are young and vigorous and with a pleasing personality; men easily trained by some method to keep up buildings and grounds.

## Modern Plant Requires Expert Care

The time has passed with the passing of the "little frame schoolhouse" when any unfortunate, cripple or aged man, whom industry cannot use, can be expected to fill the responsible position of janitor-engineer.

Isn't it good common sense to employ a trained man in a school building costing around \$85,000 or more? We would not take our \$1,000 automobile to



The class watches attentively as one of the members demonstrates the proper way to wash and wax a desk. Wichita, Kan.

a shoe repair man to be repaired. Yet we think nothing of putting an ex-laborer, farmer, or teamster in charge of an \$85,000 to \$250,000 building and expect him, without any special training, to do an excellent job. They should be trained before they are given the responsibility of a building costing those large sums; which will have, perhaps, electrical equipment costing from \$5,000 to \$20,000, plumbing costing from \$5,000 to \$20,000, furniture costing another \$5,000 to \$30,000.

Every school building and its equipment has cost the public thousands of dollars. The loss of a school building by fire—and one burns every day—which, in many cases, is due to insufficient or inefficient janitorial and engineering service, would pay the salaries of many qualified caretakers for a long period of time.

#### Kansas Establishes Janitor Schools

Recognizing the conditions outlined above, in 1927 the Kansas State Board for Vocational Education set about to find ways of improving the situation. They found Minneapolis with a model system of recruitment and training which fitted that city's needs, but only parts of which could be used in the smaller cities. Colorado had been operating a school for some time. The methods used were checked against the needs of Kansas janitors.

The training of janitor-engineers started in 1927 on the campus of the Kansas State Teachers College, Pittsburg, Kansas. Only men with practical experience were used as instructors of work methods. The first school, which lasted for five days, with 33 janitor-engineers present, was held in December. Heating and ventilating was the only course taught at this school, as this was thought the most necessary course for school janitors at that time. Through the years since that time we have conducted a total of 35 janitor-engineer schools, with a total enrollment of 3,771 janitor-engineers.

At first, one school was held in June; then such schools were held in two cities of Kansas each year. In later years, three such schools were held each year. During these days of gas rationing, we have tried two-day schools in ten cities, instead of five-day schools. We have concluded that we shall postpone schools until after the war, as attendance is a serious problem. Through the years an instructional staff of 12 well-trained practical men has been developed.

#### The Instruction

The courses offered are: Heating and Ventilating 1 and 2, Housekeeping 1 and 2, First Aid, Electrical Theory, Fire Fighting and Fire Prevention, Floor Finishing, Planning Your Time, The Care of Trees, Shrubs and Grasses. In addition to these main courses we have had special instruction by manufacturers of equipment such as stokers, door checks, electrical equipment, boilers, thermostat control, and plumbing fixtures.

The instruction given has been based upon an analysis of what the janitor-engineer needs to know in order to care properly for his building. There are 65 different jobs that a janitor-engineer is usually required to do. These are not all daily jobs; some are weekly, monthly, bi-monthly, semi-annually, and annual jobs. All instruction possible is carefully demon-



A student in the janitor-engineer course in Kansas City, Kan., washes and waxes the woodwork while standing on a ladder

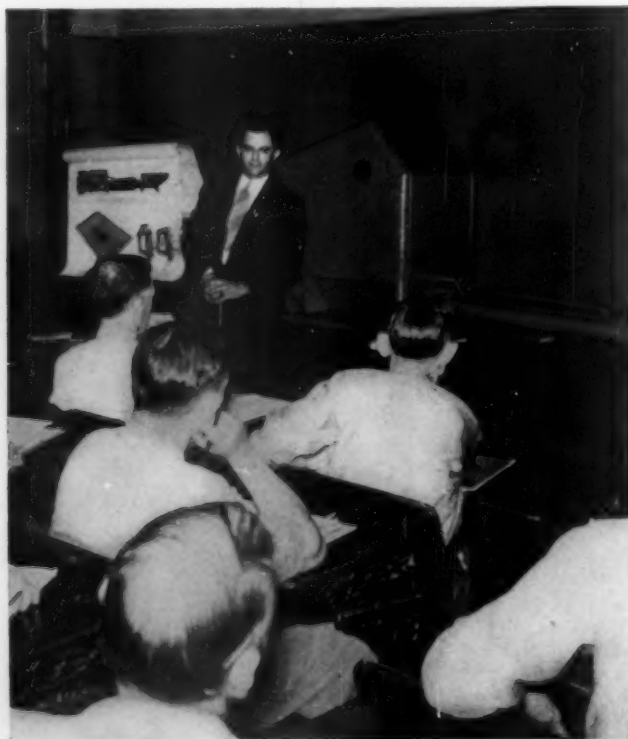
This student is mop sweeping a gymnasium using two treated 24-inch mops. Wichita, Kan.





A class in Topeka, Kan., is given instruction in damp-mopping halls. Each student is allowed to practice

The heating and ventilating class gets the facts about stokers from a traveling service man. Kansas City, Kan.



strated by an instructor to a small group. Each member of the group is encouraged to practice the method under supervision of the instructor until he thoroughly understands it and can use it. Much of the information has been reduced to job and information sheet form. As an example, separate job sheets have been prepared for the sweeping of rooms with fixed seats, tablet arm chairs, tables and chairs, and auditorium seating.

This instructional material has been developed and revised through the years at monthly meetings of the janitor-engineer faculty. At such meetings janitor-engineer supplies have been studied. No brand names are referred to in demonstrations and information sheets. Only types of materials are mentioned.

#### Traveling Service Man

In order to tie in our janitor-engineer training with the school problems of the individual janitor, we provide a traveling service man for janitor-engineers. This man throughout the year visits schools in the state, aiding the janitor in special problems that occur in his school. At this particular time, when janitors are changing so rapidly, there is a great need for this service, for men are taking these jobs who have had no training in this field.

The traveling service man shows new janitors how the work of cleaning, heating and ventilating should be done and instructs them in the proper use of supplies. When it is possible he also has round-table meetings in the evenings with the janitors of the town. He also holds round-table meetings over the week-end with janitors of surrounding towns. During the past year he held a special school for janitors and crew chiefs of a defense plant, to enable them to give instruction to new janitors at the plant. This service has helped him to learn just what training these men need for their schools.

#### Supply Companies Cooperate

Representatives of the principal janitor supply companies doing business in Kansas maintain educational exhibits in the corridors of the building where the janitor-engineer school is held. Most of these men devote three weeks during June to such work. They also have helped sell janitor-engineer attendance to superintendents of schools.

#### Other States Follow Example

Other states have adopted several of our methods of instruction and conduct one- to five-day courses. Members of our staff of instructors have operated short courses in South Dakota for the State Board for Vocational Education of that state during the past two years.

#### Effect on Morale

During the past fifteen years we have seen the old men "hired through pity," "political appointees," and "low bidders" realize, through training, that they really have a profession and an important part in the success of the school system.

During the depression a man lost his farm and got the job of janitor at a high school of a Kansas community. His board sent him to janitor-engineer school. At the close of five days of instruction, his



wife came to us and thanked us for what the instruction had done for him. Up to that time he had felt degraded as a janitor until made to realize that his work was important in the community.

#### Standards Are Improved

The fact that many janitor-engineers repeat the course after having passed it speaks much for their interest in the work. Besides actually learning effective and economical methods of performing their jobs at our schools, the mere association with others who are interested in this work stimulates them to greater efforts in caring for their buildings.

High school inspectors and representatives of janitor supply companies tell us that they usually can tell whether or not a school building is in charge of a man trained in a janitor-engineer school. His appearance is better: he usually wears the standard uniform or a local modification of that uniform. His building looks clean, and all parts of it smell clean. Because he understands the fundamentals of easy cleaning, he is able to advise his superintendent in the purchase of proper supplies in right amounts. In general, janitor-engineers have too much to do to keep everything connected with a building in proper condition;

however, through training, a hopeless situation is often changed into one of great satisfaction. He learns "to make his head save his back and his heels." This comes about as he plans a work schedule to fit his building. He learns to do this in janitor-engineer school.

#### Cost of School Relatively Low

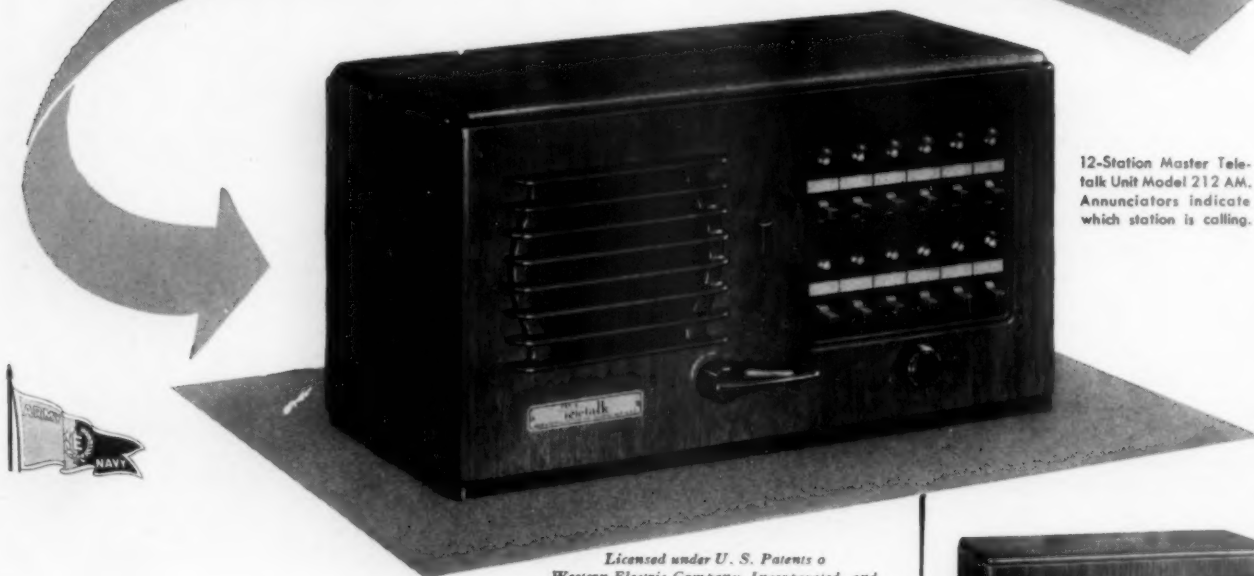
The cost of the operation and the attendance of janitor-engineer schools is low. It is easily saved each year by the increased respect for, and care of, the electrical and mechanical features of the building by the janitor-engineer who has learned how to care for and protect them properly. The enamel of plumbing fixtures is safe in his care. Seldom does the heating plant he uses require boiler repair. He does many of the nagging little repair jobs, thus saving expense to the school board. He learns to keep fire hazards out of his building.

We are reminded of the remarks of a superintendent in our first janitor-engineer school: "As long as children are required by law to attend school, it is our obligation to provide safe and sanitary surroundings for them." Only through careful selection and systematic training can such surroundings be assured.

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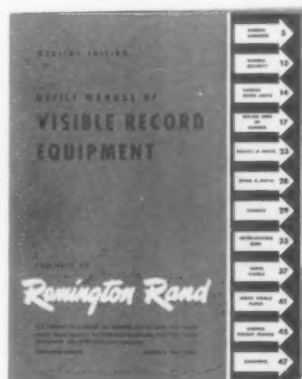




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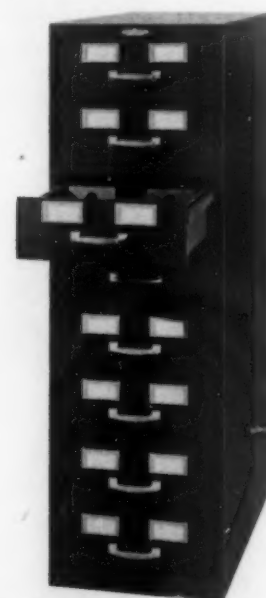
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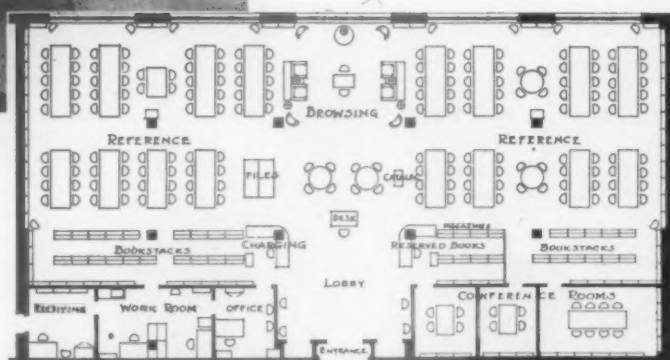
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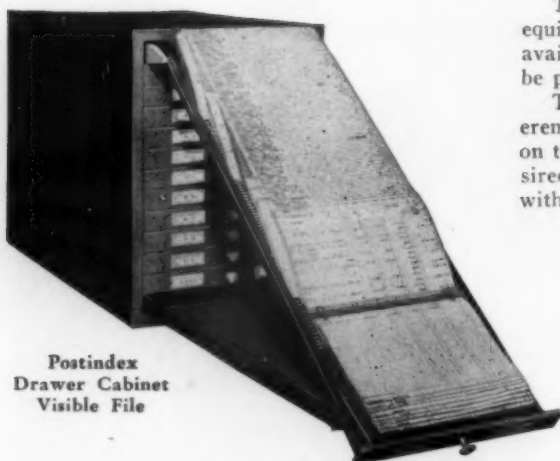
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## POSTINDEX MODEL 8 DRAWER CABINETS



Postindex  
Drawer Cabinet  
Visible File

The Postindex Drawer Cabinets are generally accepted as standard equipment for many school record requirements. Standard cabinets are available in a large variety of card sizes. Any size and any capacity may be provided for in the Postindex line of Drawer Cabinets.

This line of Postindex equipment is especially convenient for quick reference purposes since the proper drawer may be quickly located by the index on the front, and as quickly extended for finding of the card or record desired. Postindex is also fastest for posting purposes as posting is done without taking the form out of the file.

This type of equipment gives an unusually fine appearance in offices where attention to such refinement is desired. A single cabinet or a battery of these cabinets may be put on a roller caster stand so the installation may be rolled to different locations in the office, or up alongside a certain desk, when particularly desired for prolonged reference or posting.

The trays are quickly removed in case it is desirable to temporarily separate one or several trays from the installation for reference and posting at some other location. The standard trays have on an average of 90 records per tray. This varies slightly one way or the other depending upon the size of the card.

Write for Circular



## MODEL 5 FLAT BOOKS AND CABINETS

Model 5 Flat Books are most widely used among school administrators because they are readily adapted to either large or small installations and because of compactness and the convenience in handling. Flat Books are easy to post because they lie flat on the desk. A large number of records are seen at one time as an average Flat Book will hold 140 records. The books furnish a fully protected unit to carry about to any part of the building. They lend themselves ideally to housing in safes when not actually in use. Books may be purchased one at a time to add to present installation. Flat books are made of aluminum and very light to handle.

Write for Circular



## VERTICAL STUDENT ROSTER

This unit is designed to permit immediate transfer of student records from present blind files to visible file with up to 375 names in sight at one time. The record forms are simply placed in the slotted index cards and name labels inserted under celluloid tabs. The unit illustrated is WV-Z8575-C for 8 x 5 forms and is completely assembled ready to use with a supply of index labels.

**Individual School Census Card**  
Postindex form 81-C-6385-S. This shows one side of a two-page card which incorporates complete census information and attendance information. The back side of this card shows history of employment

**School Enrollment Card**  
Postindex form 81-B-2916-8P. This is a two-page form with illustration showing the enrollment record. The back side of this same card covers daily program record

**Individual Child's Daily Program**  
Postindex form 81-B-2913-S. This is a four-page form with illustration showing the daily program for a student. The other pages are devoted to registration information and attendance

**Individual Pupil Cumulative Record**  
Postindex form 81-C-06072-SCT. This illustration shows one page of a four-page form covering educational history, ability and achievement test record. The other three pages provide for scholarship record and health information

**Secondary School Cumulative Record**  
Postindex form 81-C-05971-SCT. This illustration shows one page of a four-page form with academic record and attendance information. The other three pages provide for general information, extra curricular activities, achievements, with space for intelligence and achievement tests

**School Cumulative Record**  
Postindex form C-4077-P. This is a four-page form with illustration showing the elementary scholastic record. One of the other pages covers scholastic record for Junior and Senior High School while the other two pages provide space for recording pupil activities, guidance facts, intelligence and achievement tests

**Individual Health Record**  
Postindex form 81-C-06121-SCT. This is a four-page record with illustration showing a portion of health history. The other three pages are devoted to a continuation of the same record

**Individual Achievement Record**  
Postindex form 81-C-6387-S. The illustration shows front side covering intelligence tests and achievement tests. The back side is a continuation of achievement tests

**Teacher's Card**  
Postindex form 81-C-06112-SCT. This is a four-page record with illustration showing teacher's experience. The other three pages are devoted to personal information, educational background, special training and certification, health and general remarks

**County Financial Accounting Record**  
Postindex form 81-C-06111-14CT. This is a four-page form with illustration showing financial record. Other pages are devoted to census, enrollment, attendance and information about board members, also State and County financial support

**Florida Form**  
Postindex form 81-C-6370-S. This is a four-page form with illustration showing the teacher's certification, extension and renewal record. The other three pages are devoted to experience, training and general information

**Wisconsin Form**  
Postindex form 96-C-5740-14. This is a four-page form with illustration showing State Aid data. The other three pages provide record in regard to statistical information, census, enrollment and teachers





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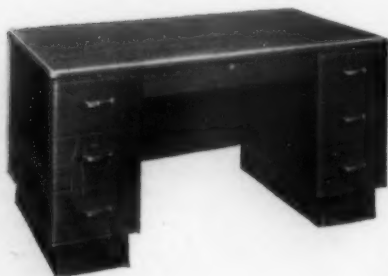
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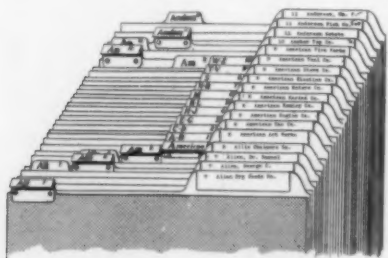


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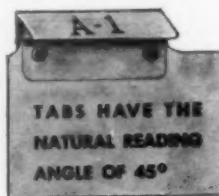
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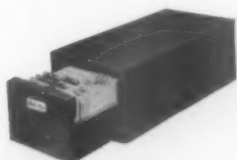
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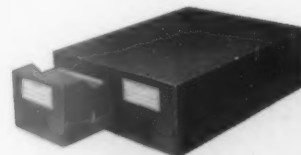
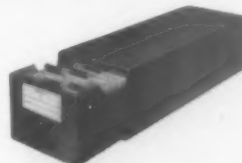
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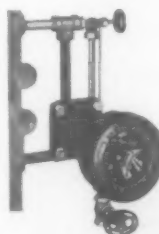
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For domestic and industrial oil burners. It operates direct from the light of the flame. Among its many desirable features is the fact that it may be built within the burner unit—a step ahead in oil burner controls.



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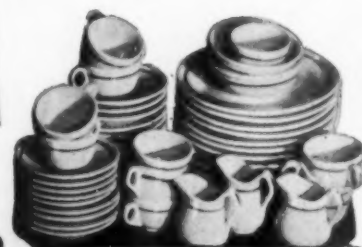
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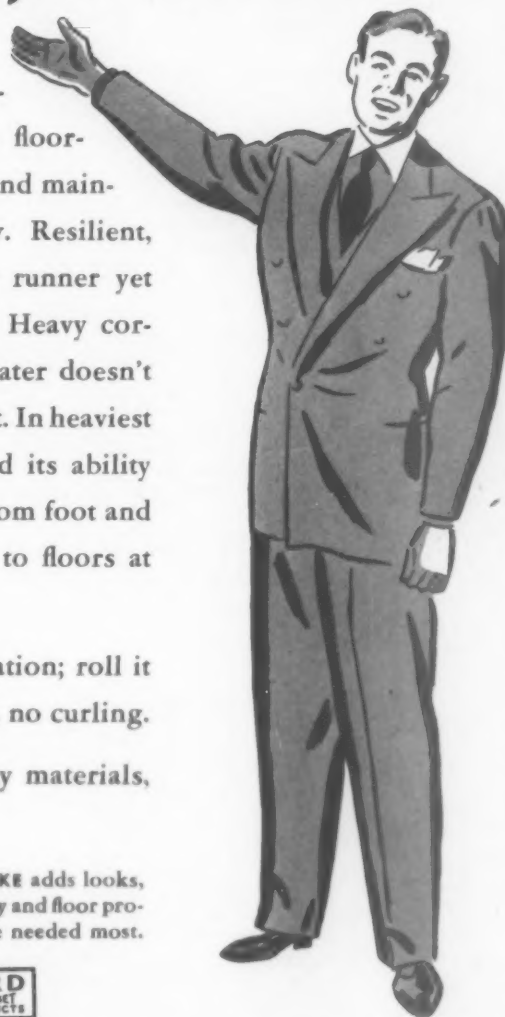
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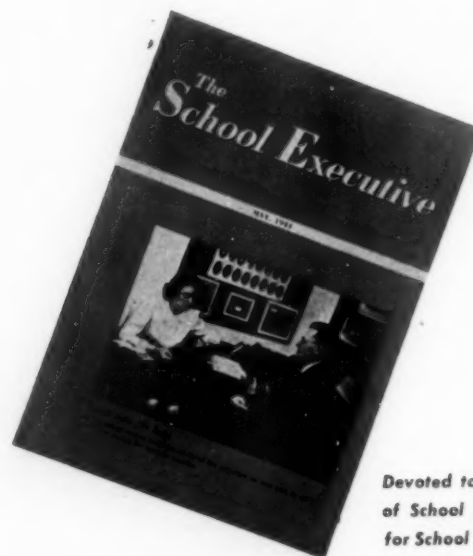
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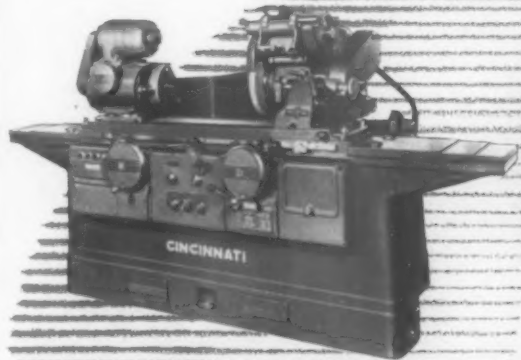
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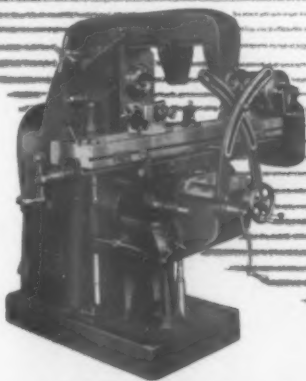
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THE AMERICAN SCHOOL AND UNIVERSITY—1944

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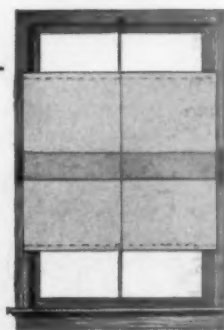
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